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(January through November)

ng Engineer

November 1959

IR. H. RUSTING, consulting engineer of The Hague and secretary of the International Federation of Consulting Engineers (FIDIC), says it is difficult for United States engineers who hear nothing but English in their day-to-day business negotiations to realize the barriers created by languages, and the implications of the variety of cultural backgrounds behind them. "Americans have a tendency to oversimplify

Continued on Page 14





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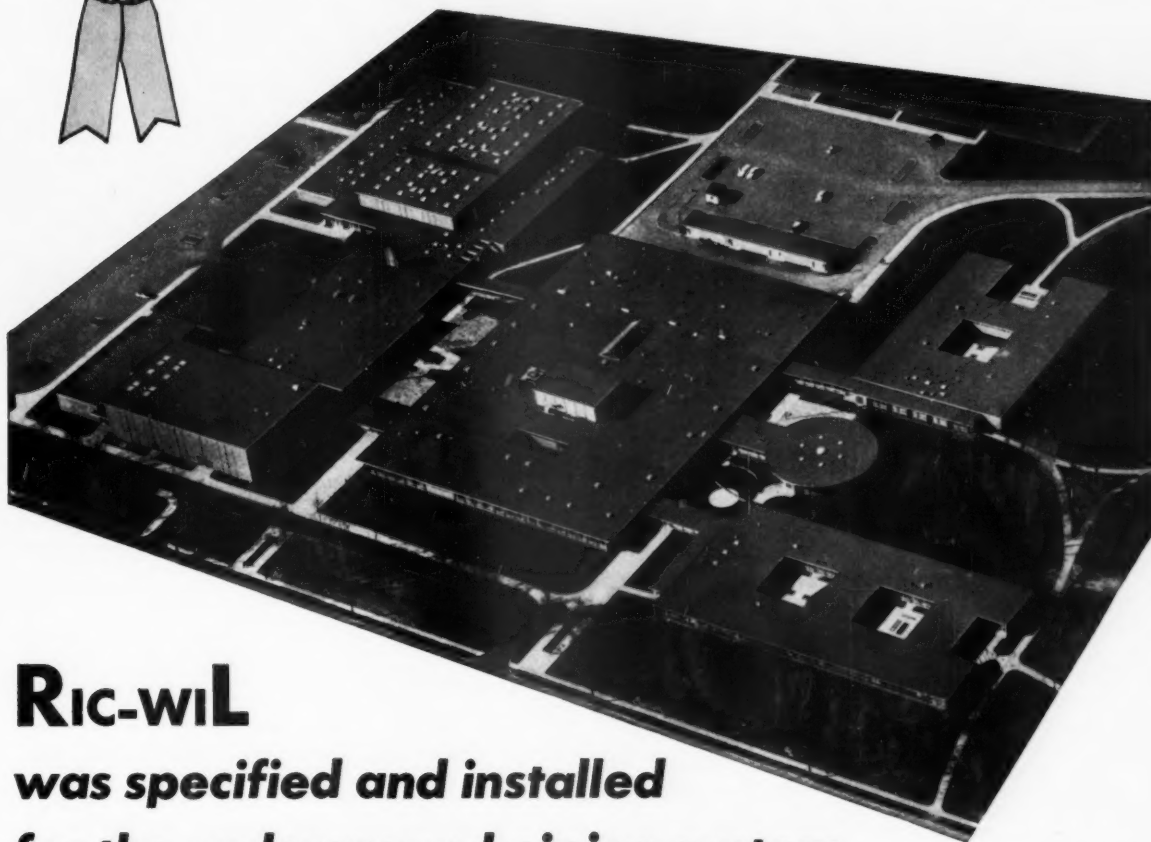


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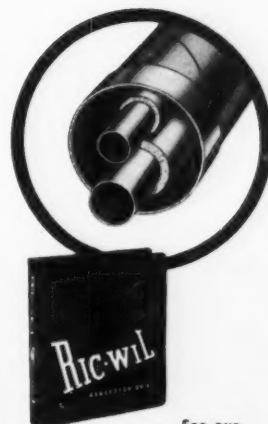


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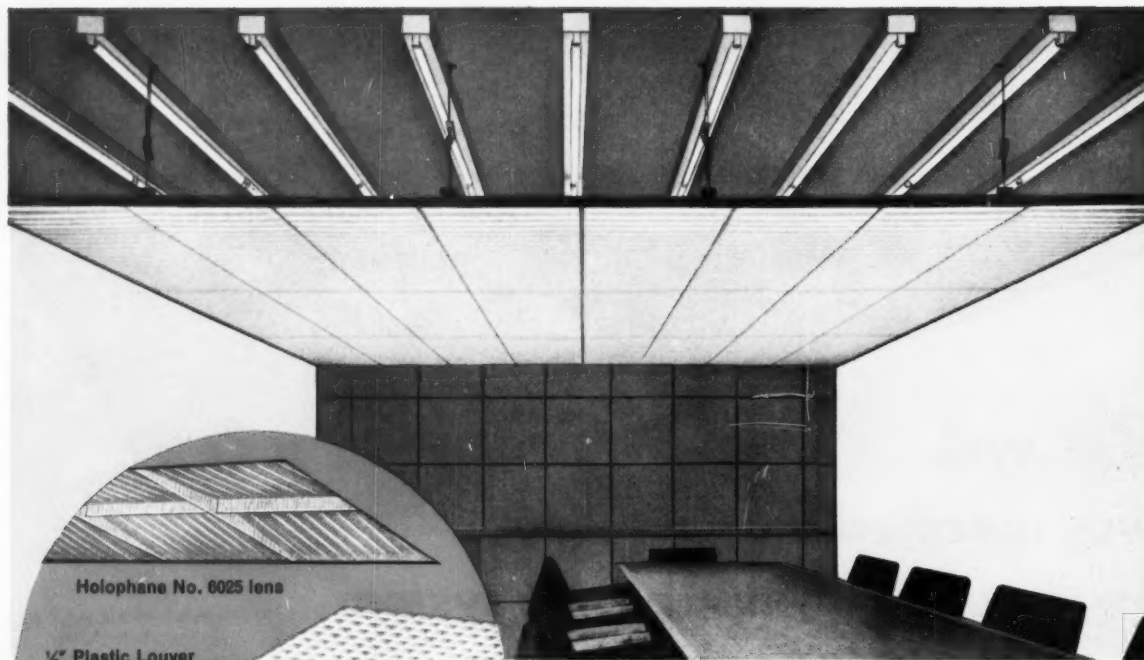
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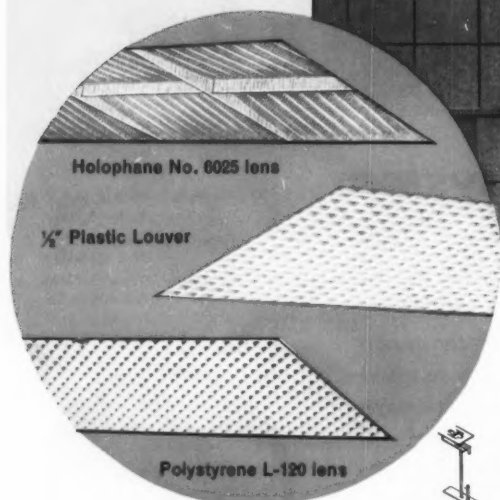
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November 1959 • VOLUME XIII • NUMBER V

ARTICLES

- 104 The Sketchbook of Villard de Honnecourt
James Kip Finch
- 110 Designing Flat Plates and Slabs
E. Vernon Konkel
- 114 More Light With Less Heat
Ernest F. Siegel
- 120 Justifying Service Facilities For Tax-Supported Institutions
Gordon W. Neal
- 126 Controlling Vibration With Soil Stabilization
J. F. Wiss, J. A. Zurbrigen, and J. P. Gnaedinger
- 130 How to set up a Master Specification
Hugh C. Carter
- 134 Under the Thames to Wapping
F. C. Livingstone
- 140 Liberi Professionisti . . . or Private Practice In Italy
The Economist Intelligence Unit Ltd.

DEPARTMENTS

- Cover Personality — Ir. H. Rusting
- 32 Readers' Comment
- 44 From the Editor's Tranquil Tower
- 52 Readers' Guide
- 64 Report from the West Coast
- 80 Heard Around Headquarters
- 100 The Legal Aspect
- 149 Krick Weather Forecast
- 158 Field Notes
- 166 The Word from Washington
- 178 Atoms in Action
- 192 News for the Consultant
- 210 Men in Engineering
- 224 Books
- 248 New Projects Reported
- 266 Consulting Engineers' Calendar
- 268 Advertisers' Index
- Part II A Directory of Advertisers' Literature

The Engineering Index Service in Public Libraries lists articles from Consulting Engineer

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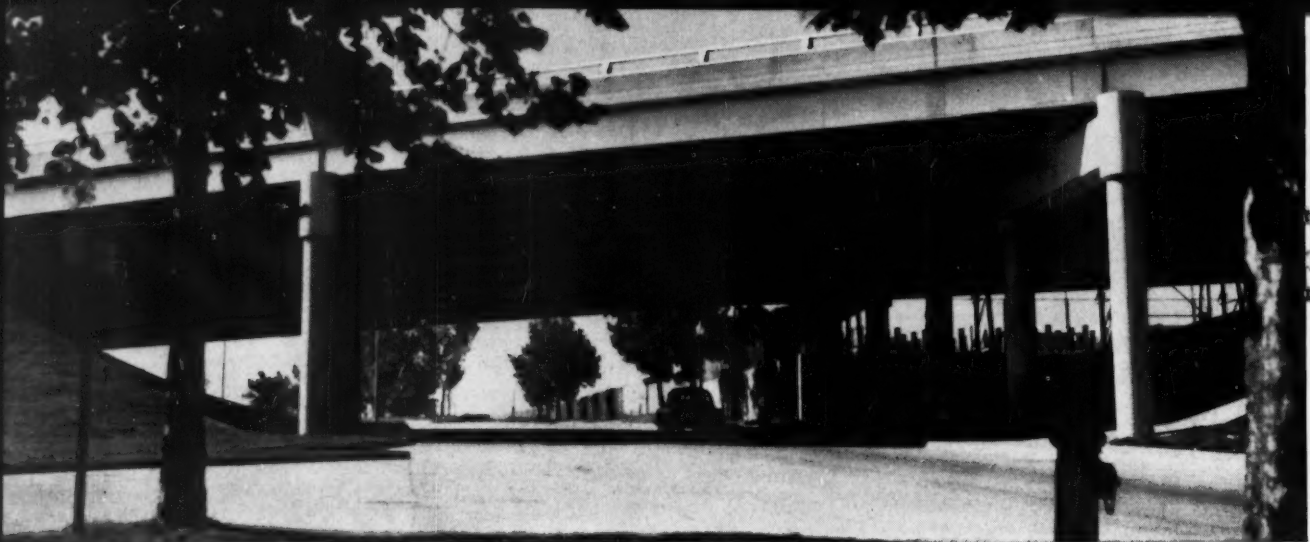
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This Mark Twain Expressway bridge has 3-span continuous girders 64'-76'-64'.

Steel is specified in 70% of bridge designs



This 4000' section of the new St. Louis freeway is a series of short-spans from 60' to 100' long. Cost of overpass: \$6 million.



Major General Sverdrup (at right), President of Sverdrup & Parcel Engineering Co., discusses an Interstate Highway bridge with Mr. Brice Smith, Vice President of the firm. General Sverdrup was acting Chief Engineer to General MacArthur and later Commanding General of the Engineer Construction Command in the Southwest Pacific during World War II.

at Sverdrup & Parcel Engineering Company, St. Louis, Mo.



Detail of short-spans on 6-lane overpass, St. Louis, Mo.

Major General L. J. Sverdrup is president of Sverdrup & Parcel—world famous for highway and bridge designs. He says that the advantages of steel in bridge construction are proven by experience which accounts for 70% of their bridge designs being specified in steel.

One of the firm's most recent short-span projects is the \$6 million, 6-lane, 4,000 foot overpass which cuts through the heart of downtown St. Louis. According to General Sverdrup, they used steel beams because they couldn't afford the extra time, special equipment and additional manpower needed to do the job with other materials. It was estimated that downtown traffic would have been tied-up for three to four months if they hadn't gone to steel. By using steel, all they had to do was swing it into place, bolt, rivet, weld . . . and they were in business.

Sverdrup & Parcel feel safe in specifying structural steel because its stress and endurance factors are a part of their library of proven facts.

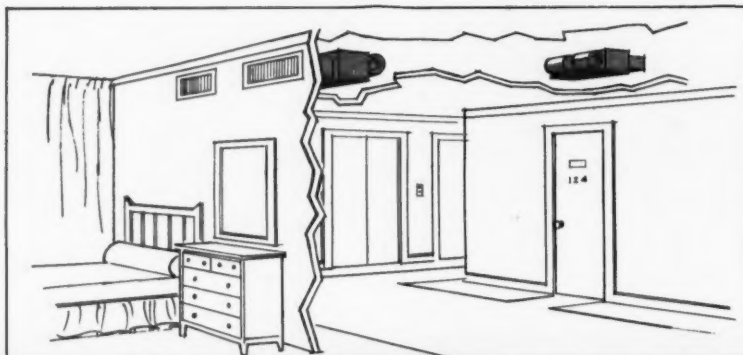
In addition to the St. Louis highway project, some of the firm's outstanding achievements include: eight bridges across the Mississippi; six bridges across the Los Angeles River; two across the Ohio River; and structures on the Interstate Highway System, such as the Mark Twain Expressway bridges, as shown.

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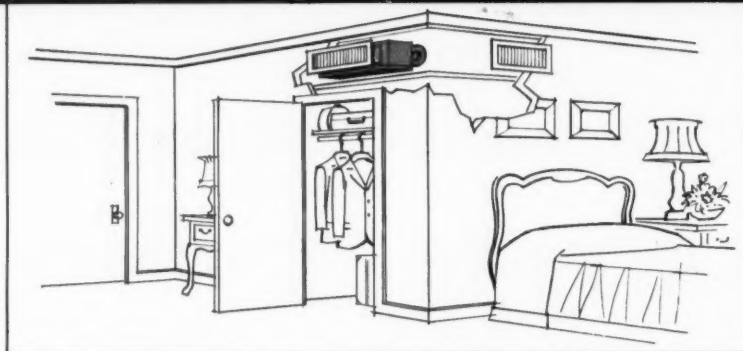


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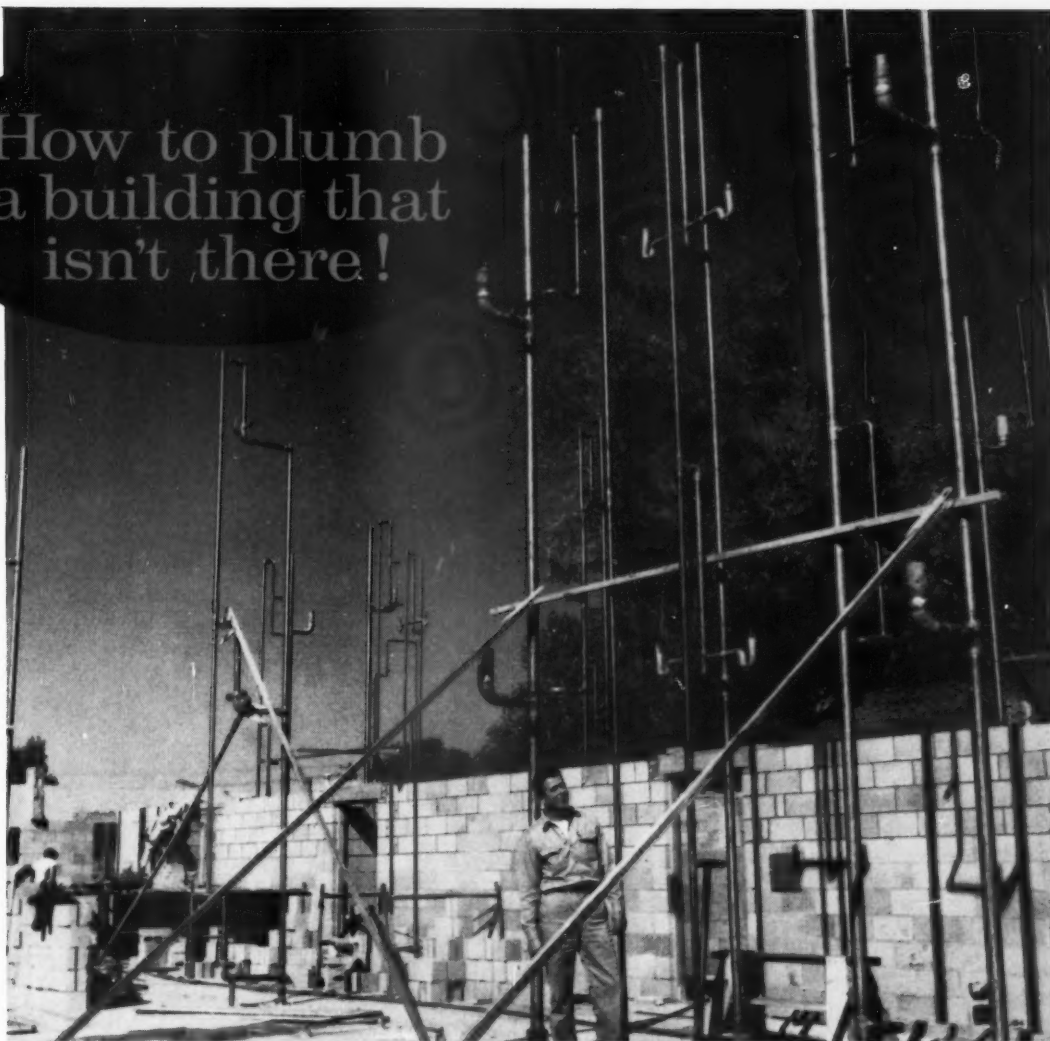
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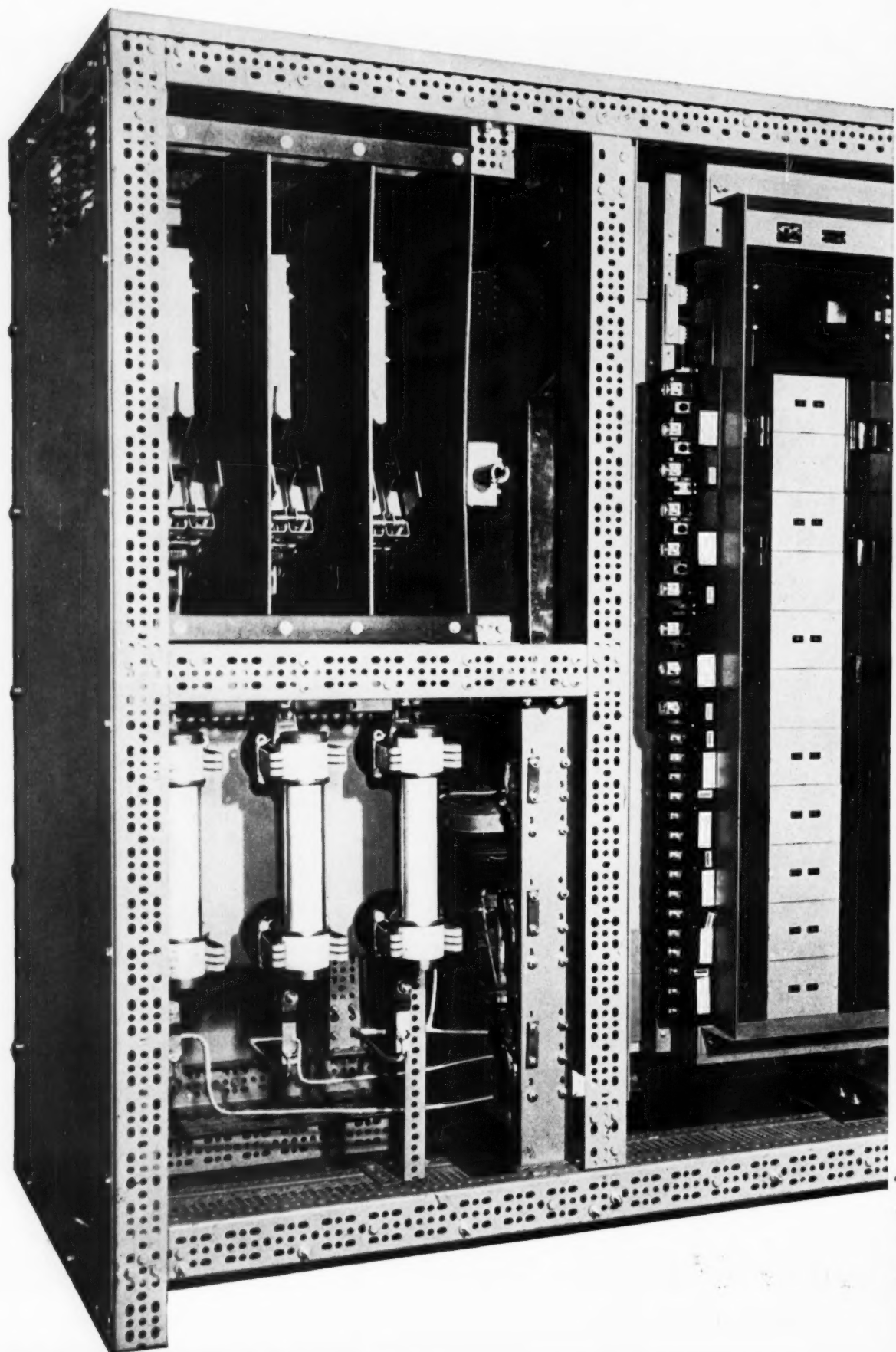




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NOVEMBER 1959



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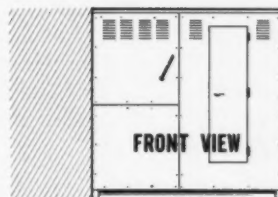
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Ir. H. Rusting

— Starts on front cover

such problems. After all, even the Americans and the English express themselves differently, and certainly have different outlooks on life. You can imagine the difficulties when you try to convey one of your own ideas in five different languages. In FIDIC, as in any international organization, we have to be careful in discussions to see that disagreements really are different points of view, and not a misunderstanding based on translation."

Rusting told of one instance in which a FIDIC group was asked to "nominate" someone for a committee. In this case, "nominate" translated to "appoint," and as a consequence needlessly troubled waters had to be soothed. "There was no difficulty in doing so," Rusting added. "Everybody knows the snags by now."

Trends in Languages

Currently, English is the accepted "second language" of most Europeans. Rusting said that most Europeans began to realize the importance of speaking English during the 1920s. The United States was coming into international prominence more than ever before, and the British Empire still was a powerful influence.

Then came World War II. French under the pressure of circumstances had declined as an international vehicle of thought, and German was put in prominence in public schools throughout Europe, but the children did have access to English by listening to the Voice of America. "Most of us kept our English polished during those years of listening to the radio. Forbidden fruits tasted good!" Rusting recalled.

The French, naturally, would like to see French become the international language once again. "But they are wise about it. Instead of arguing for French to be spoken, most French merely try to make you want to speak French by illustrating the beauty of their language and the crystalline clarity of their expression."

Even in circulating correspondence to the FIDIC executive committee, language is a difficulty. "We have a total budget of some \$1500 this year. We hope to increase this substantially in the near future. On this amount of money, however, it is not possible to have all correspondence translated into the three basic languages. Even if this were possible, only three out of the six present members of the executive committee would get the opportunity of discussing matters in their native tongue. So even translating into three languages does not present a real solution to the danger that some of the men might lose their interest in some FIDIC

affairs because of the time and trouble it takes to get the letters dealing with the more intricate matters translated," Rusting added.

Translation Important

Of course, FIDIC is fortunate to have Rusting as secretary. He speaks French, German, Dutch, English, and Italian, and can read Spanish. He frequently translates at meetings. "Often the men for whom I translate in meetings understand the language being spoken, but are (unnecessarily) shy about speaking if they think their command of the language is not perfect," Rusting added.

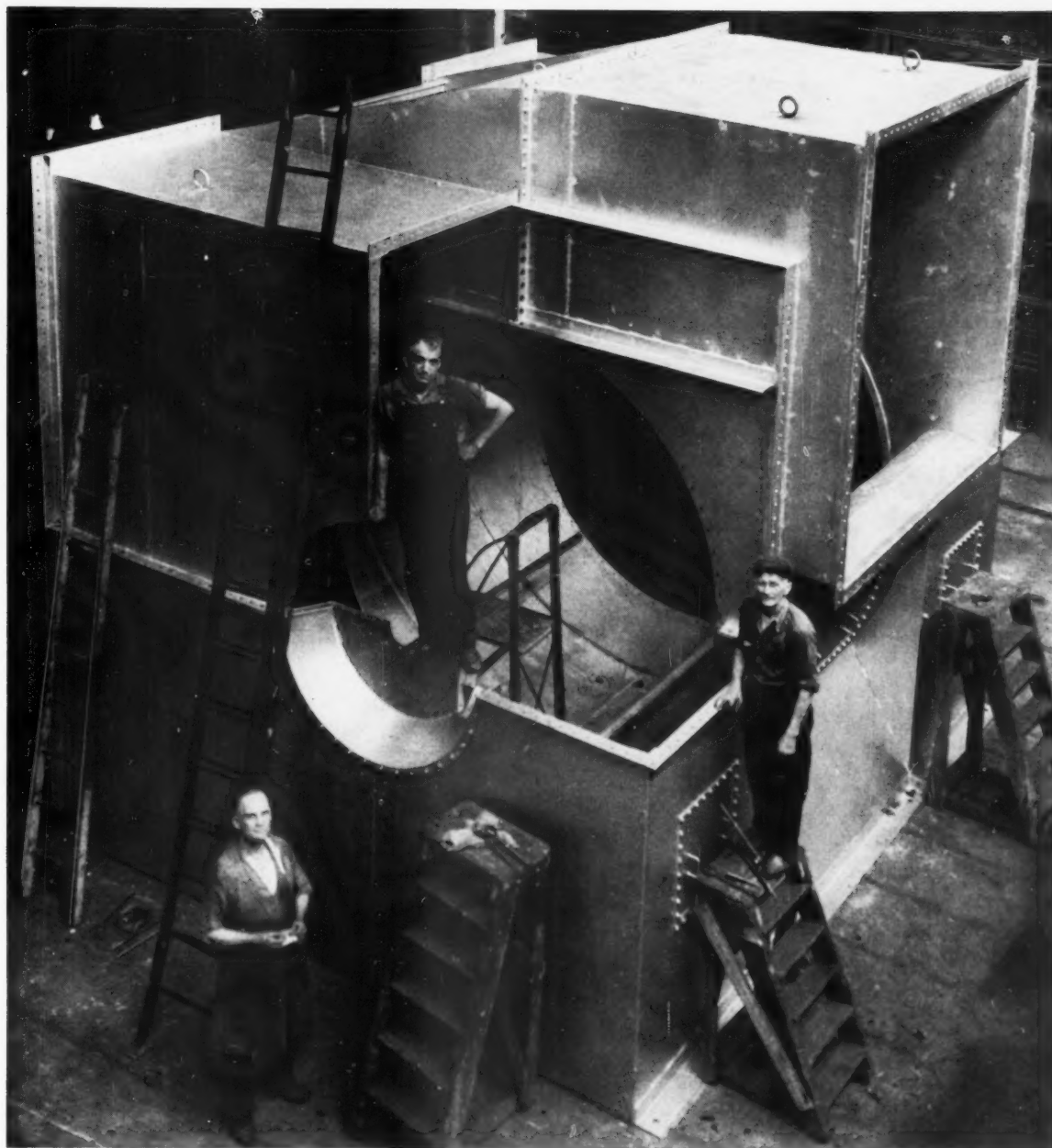
Secy. Rusting stressed the language difficulties because he thinks it is essential that the Americans realize the importance of it. "Although most of the executive meetings are conducted in English, it would be unrealistic to expect that they always will be in the same language in the future. As matters stand, members are free to express themselves either in German or in French as an alternative, and this is done frequently by some of them if they wish to explain situations as they prevail in their own countries. For this reason it is an advantage if officers have a working command of more than one language. Still this requirement is a secondary one. The obvious solution is to choose one language and engage interpreters if the necessity arises."

Suggestions for CEC

Rusting had several suggestions for the Consulting Engineers Council to bear in mind in selecting future delegates for FIDIC. "The man should be widely traveled. The roots of Western civilization date back more than 2000 years ago to the Greeks, the Romans, and other centers of early civilization. Its elements were stressed differently in various centers in Europe such as Spain, Scandinavia, France, England, Germany, and others. This finds expression in different legal systems and a variety of ways of life which must be experienced to be comprehensible.

"The United States had the benefit of a 'fresh start' not much more than 200 years ago and could melt down imported concepts into a more homogeneous system to suit its needs, with a single language. To the less discriminating tourist, many European customs may appear to be just a tumble-down arrangement that could easily be rearranged to suit U.S. standards. Things are not so simple. To be effective, an American delegate must understand the reasons and attitudes behind the reactions of the various delegations."

Another imposing problem the Americans must face is expense. "The United States has done us the honor to send delegates half-way around the



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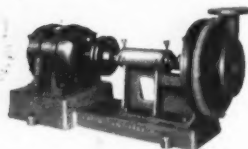


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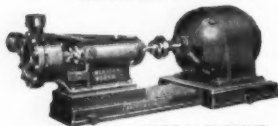
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world to attend the meeting. But its representatives' contribution as officers or executive committee members probably would be hampered if they were seeing the other FIDIC people only occasionally at meetings. Most important, would the Council be willing to undertake the expense of sending a delegate often enough to take part in at least some of our informal committee meetings that are so important to the continuing activities of FIDIC?"

Rusting stressed that he is trying to encourage United States' participation in future FIDIC activities because he admires the national drive and genius for organization. But he also wants Council members to understand the problems involved in active participation.

"I have one other suggestion in the selection of a delegate. I have found that experience cannot be transmitted in writing. It is something personal, gained by a man over a period of time. Therefore, I think it would be of benefit to the United States to keep the same delegate over a long period of time. That way, the valuable understanding he gains will not be lost by a frequent change of delegates."

Budget Problem

What about FIDIC's extremely small budget of \$1500 a year? It has resulted in heavy contributions of time on the part of delegates, but there is a certain strength in depending so heavily on voluntary work. Nothing maintains a man's interest in FIDIC like giving him a job to do.

Rusting does not foresee that FIDIC could afford a paid executive director at any time in the future. "We would need a consulting engineer with a full understanding of the international problems involved. No consulting engineer I know could afford to work for what FIDIC would be able to pay."

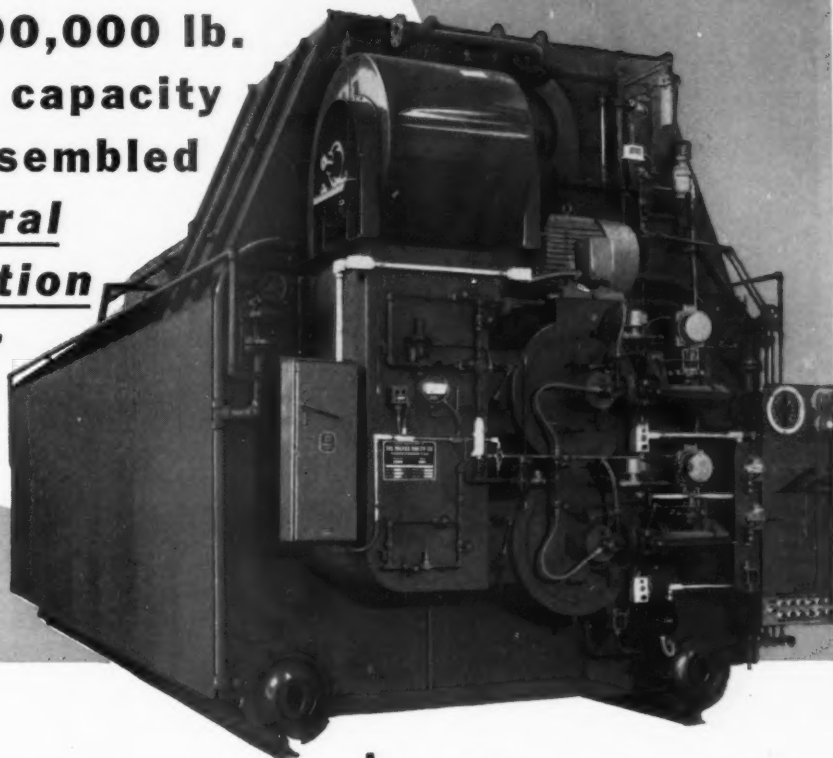
Geneva Office

Taking an office in Geneva has been discussed. However, the question of money again arose. "We decided that first we must use our funds and energies toward selling our member associations on the importance of FIDIC. In doing this, we will continue trying to make the best possible use of our current facilities."

Geneva was mentioned as the possible site of an office because it houses many important international organizations. Having an office there might have some special publicity value. "Technically, FIDIC is a Swiss organization. It was felt that it might be wise to give FIDIC a legal status and that was only possible if it was incorporated under some national law. The late Robert A. Naef of Zurich suggested having FIDIC registered in Switzerland during the time he was president (im-

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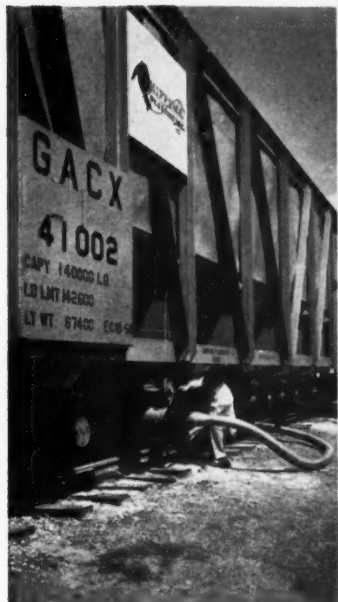




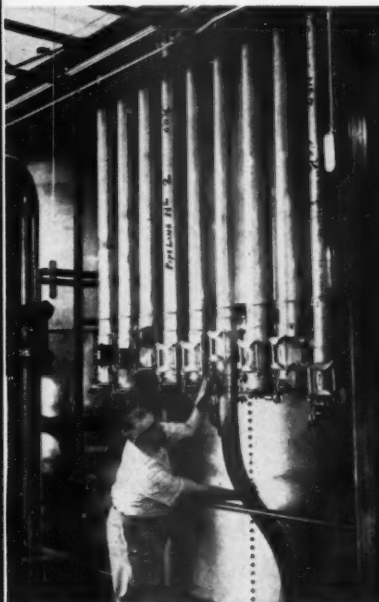
D. M. Nutter, Vice President in charge of production at Chippewa Plastics Company, Chippewa Falls, Wisconsin, reports:

“Airstream conveying pays the rent on our new plant”

“Savings in labor and materials costs make this possible. Our Dracco Airstream Conveyor System replaces hand-loading methods used in our former plant. Now we move from raw materials to finished product . . . without manual handling. Here's how:”



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“The suction-pressure system draws material to the Airstream Receiver, then blows it into any of 12 storage silo inlets. Conveying air is thoroughly filtered to prevent contamination. The quick-disconnect hose is easily switched from one inlet to another.”



“Out-of-the-way conveying lines distribute different polyethylene resins to storage. The system handles a million pounds of material a month. It's been foolproof, maintenance-free, easy to operate. We believe it shows the way materials handling is going.”

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formed of what is going on, but in this light we also have assumed that silence on the part of the members indicated agreement. When trying to improve this system we have had valuable suggestions from our members. There never has been criticism of the fundamental method in the past."

Rusting explained that—again due to the diversity of languages—FIDIC meetings must be planned in advance. Anyone wanting a topic to be discussed at the next meeting must make the suggestion in writing well in advance of the meeting. This allows the suggestion to be translated as necessary and circulated among the executive committee members.

All topics cannot be accepted for a number of reasons. "Naturally, people in different localities attach varying importance to the same topic. We must judge what is most important to the largest number of members. Also, above all, we must keep any politics out of FIDIC matters. There is nothing that would kill an international professional organization faster than getting into a political discussion. And sometimes we might see political implications in a question when the man who suggested it had not thought of such a thing."

Officer Continuity

What about the FIDIC officers all offering themselves for re-election, and being elected? "There are several ways of doing things. Some organizations have a frequent change of officers merely to get new faces in charge. Others purposely keep a continuity in the officers, who are experienced in the operational problems of an organization. It depends on which system the members prefer.

"In this case, according to FIDIC statutes, members of the Committee of six are in office for four years and can be re-elected for another term. Elections were due at The Hague meeting. Although members had been requested to make nominations, none came forward.

"Remember that any man who is elected to an office in FIDIC must be prepared to donate a large portion of his time to the organization and to attending meetings. It is not easy to find men who can do this. And then there is another thing to be considered. We stress the point that FIDIC officers are chosen for their personal qualities only. But we still try to make a generally acceptable balance between representatives of various areas.

"If any member association wants to see changes made in the way FIDIC is operated (which of course would imply a change of statutes), we would be happy to hear from him. All we ask is that he put the suggestions in writing, so they can be properly circulated to the executive board. The United States should not find it difficult to become



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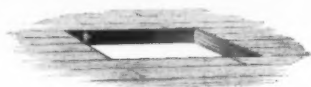
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represented on the executive board if this is what is desired," the secretary continued.

FIDIC Programs

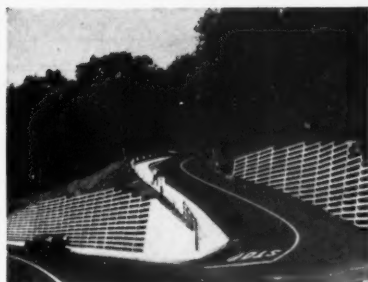
Current FIDIC activity involves "quite a bit of correspondence on current topics, such as drafts for several international regulations, the consequences of the Treaty of Rome (European Common Market) for the profession, and the adaptation of FIDIC's own organization to its growing field of activity and importance. Of course, one of our most notable accomplishments to date is the Conditions of Contract for Works of Civil Engineering Construction, which is being used on a three-year trial basis ending next July."

One of the most vital problems facing FIDIC, with its recently expanded membership (United States, Canada, Australia, and South Africa are all new members) is communications. "We want to find a way for our members to participate more actively in FIDIC affairs. Basically, this must first be approached through giving the member associations more information on what FIDIC is doing and hopes to do."

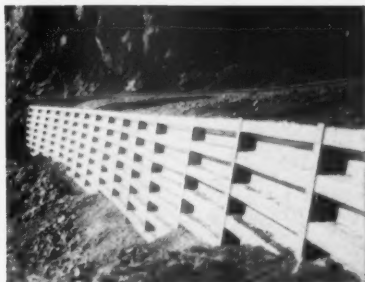
Another question for the future is an international fee schedule. Some member associations want to see a definite Minimum Fee Schedule prepared. This is difficult enough in an area like the United States, but approaches the impossible on a world-wide basis. "The tasks undertaken by consulting engineers in various countries under seemingly equal agreements may be widely different, and the same amount of money buys different quantities, either in intellect, labor, or equipment. Such things must be taken into consideration. However, the matter is being given an appreciable amount of continued study with a view to its importance in international practice," Rusting explained.

U.S. Meeting?

What are the chances of FIDIC holding a meeting in the United States in the near future? "Do not get the idea that we would not like to come to the United States. Most of the consulting engineers I know would greatly enjoy a visit to the States. But for many of some 25 delegates, the transportation costs alone would be an almost insurmountable obstacle. The Council delegate, Edward J. Wolff, suggested that perhaps a resort hotel away from a city would be one means of reducing expenses, but I am afraid that would not really solve the problem. Any consultant who paid the fare to the United States would want to see some of its highlights and be willing to bear the expenses involved. As a matter of comparison, it costs me less than \$100 to go to a meeting in Paris, and a similar amount is sufficient for many delegates. A meeting in the States



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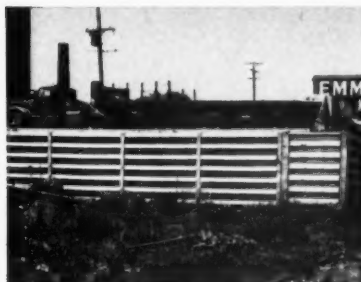
Replacing Existing Wall?



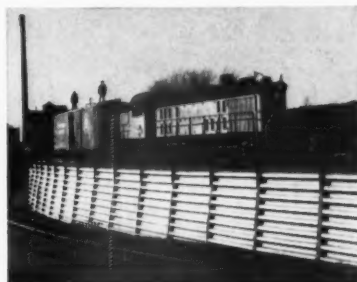
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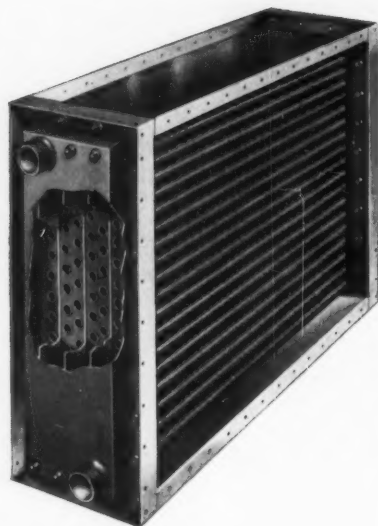
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would be quite a different matter." Rusting then mentioned that the annual FIDIC meeting next year is scheduled to be held at Stockholm.

International Background

Rusting was born in The Hague, educated in the Dutch East Indies and in Delft, and now lives in The Hague. However, he has quite an international background. When Rusting was a child, his father opened a pharmacy in the Dutch East Indies. Naturally, young Rusting thought he would like to be a pharmacist when he grew up. "My father discouraged me, explaining that I had no basis for comparison and urging me to look into other professions carefully." The pharmacy influence continued to the extent that Rusting chose chemical engineering over the other branches.

Rusting returned to The Netherlands alone when it was time for him to enter college. He was graduated from the Technological University in Delft after six years of study. "I took an extra year to finish so I could combine studying and traveling. With another student, I conducted tours of industry in Czechoslovakia and Germany shortly after the end of World War I."

From college, Rusting went to work with a small industry developing automatic machinery, but during the depression, he found himself with no job. "Looking around, I could not find another job so I decided it was a good time to take a vacation." Rusting went to Italy where he learned Italian and studied ancient art. After another look around Holland for a job, he then went to England, where he brushed up his English and studied economics.

"I went to work with an industrial consulting engineering firm in 1938. We were bombed in 1940 and again I had no job. At this point, I went into business for myself."

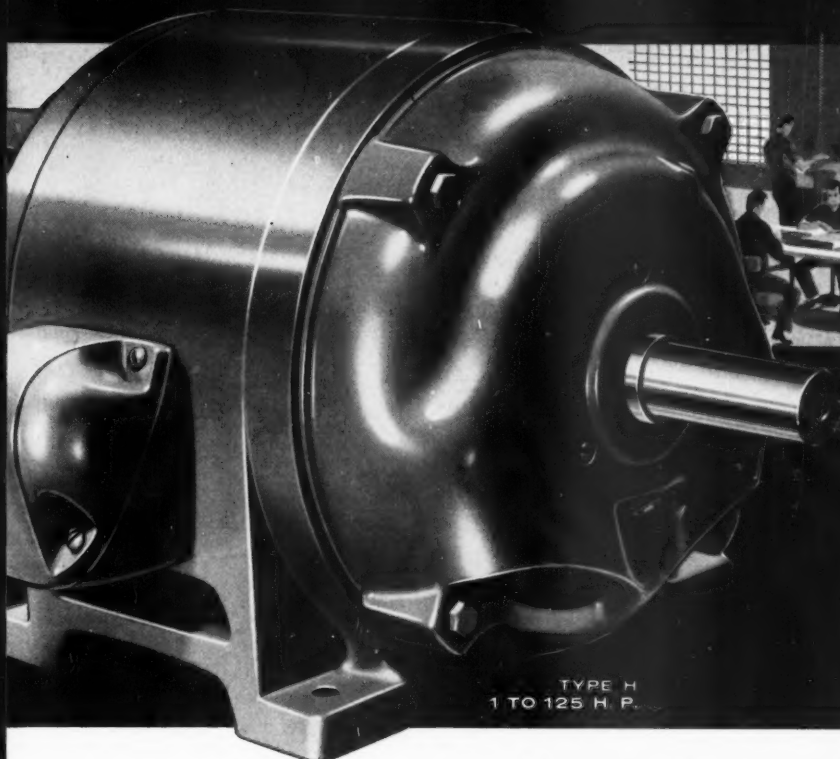
Consulting Practice

Rusting's work is on a confidential basis for industrial clients, so he was reticent to discuss specific projects on which he has worked. However, his specialty is feasibility studies for industry. Most of his clients request his advice on plans for present and future expansion. Rusting includes everything from personnel to economics in his engineering studies. However, he leaves the design to other consultants. "I always recommend that they retain another consulting engineer when my portion of the project is completed.

"If I get the chance, I always strongly recommend that consultants for the industrial engineering and for the design of the project be retained side by side, right from the start. I honestly think that this is in the best interest of the client," Rusting added. ▲▲



production shutdowns **cost more than motors!**



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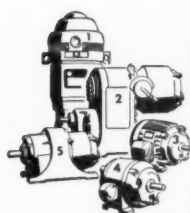
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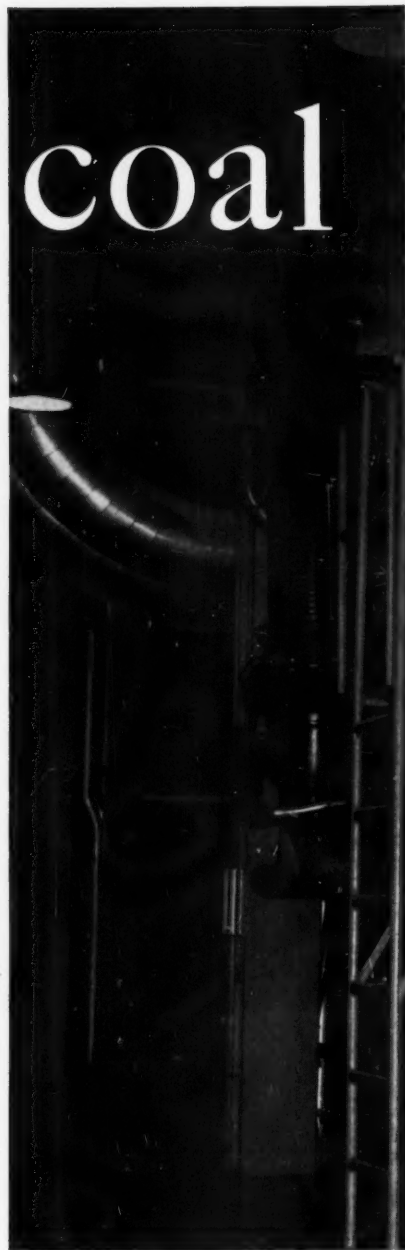
Technical advisory service

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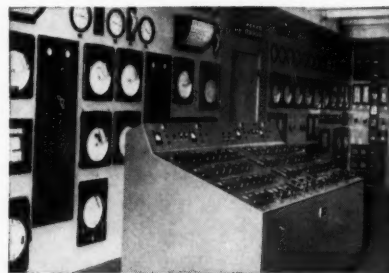
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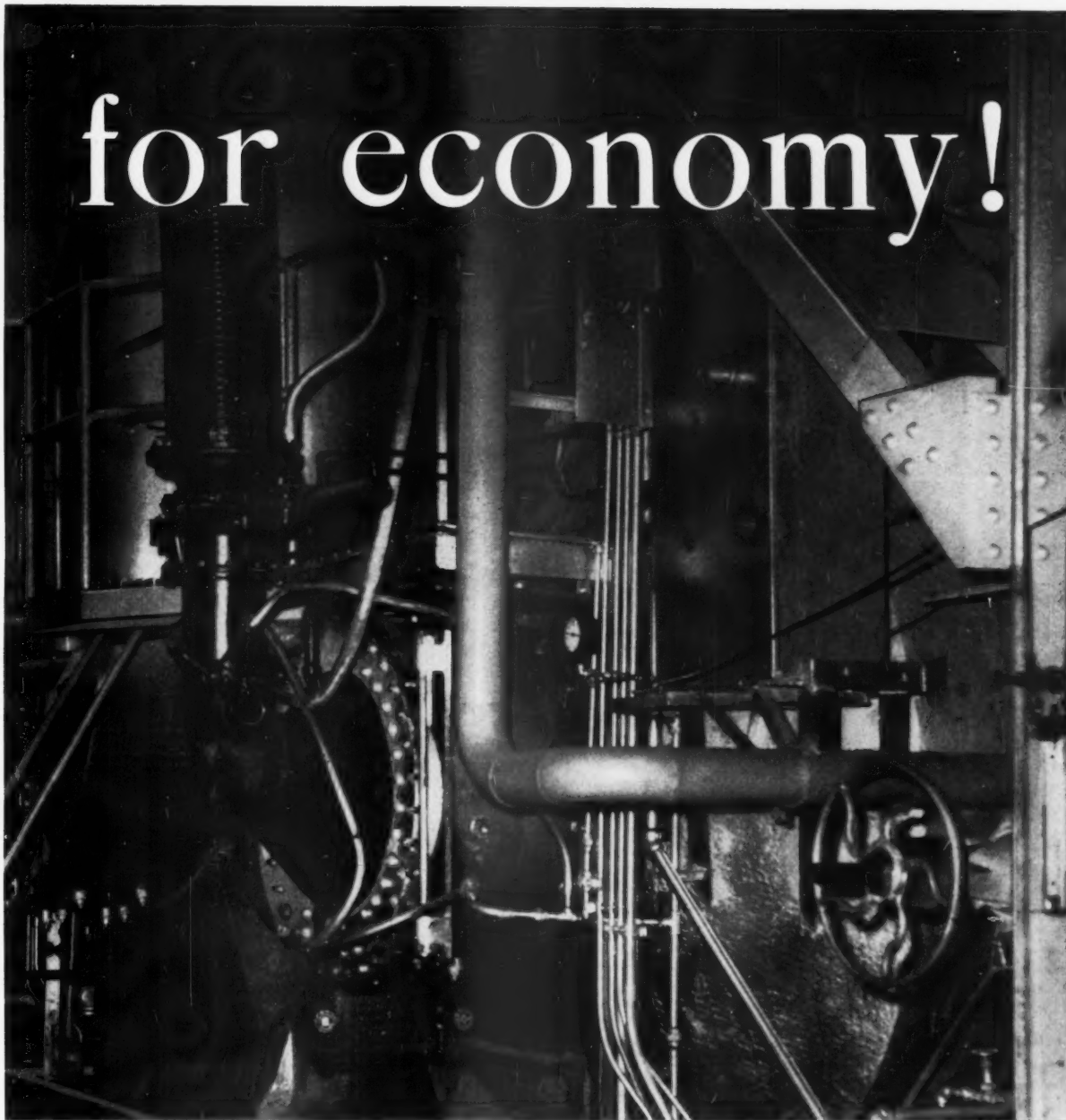


Hagan Boiler and Fuel Control panel regulates two 450,000 lb/hr Babcock & Wilcox boilers for complete, automatic control of steam generation. Generators and steam distribution are also controlled here. Feedwater control, Bailey Meter Co.



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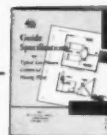
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View from roof of power plant showing river barge delivering coal. Harnischfeger Crane unloads barges into hopper which feeds crusher. From here, Jeffrey Conveyor on right moves coal into inside bunkers, then into 650-ton Neff & Fry silo.



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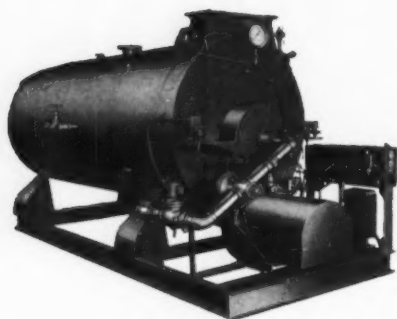
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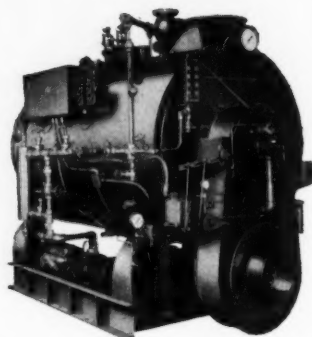
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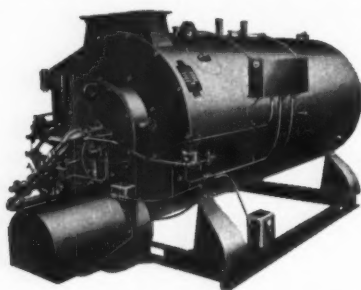
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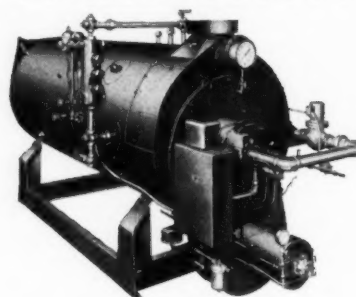
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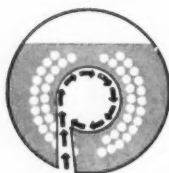
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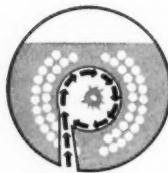
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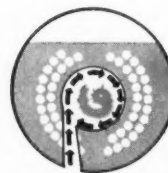
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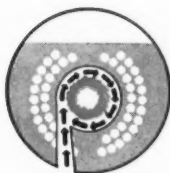
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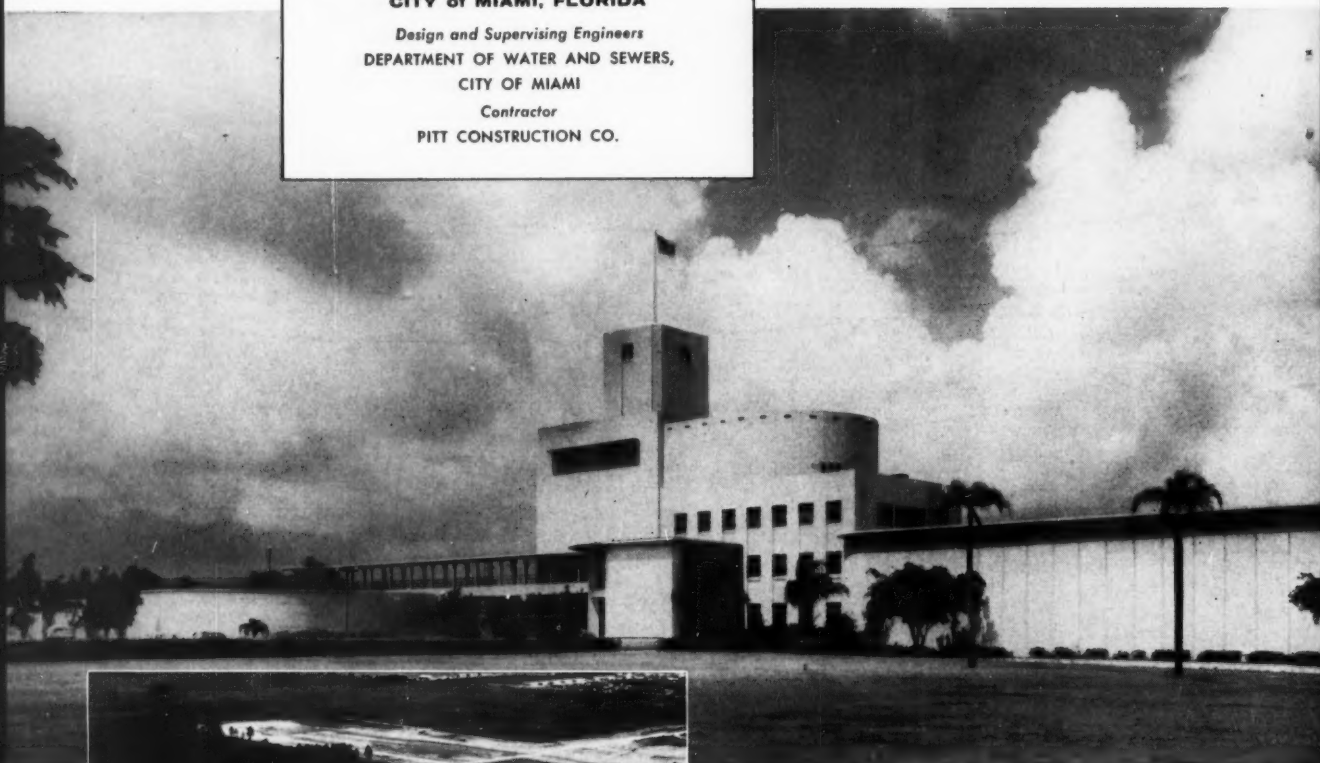


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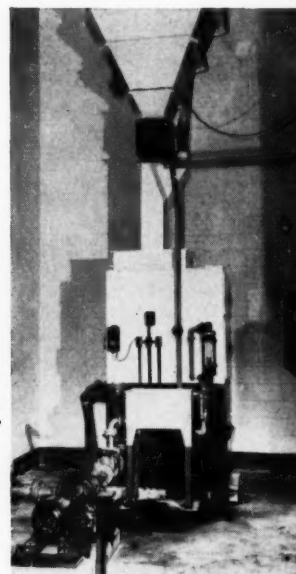


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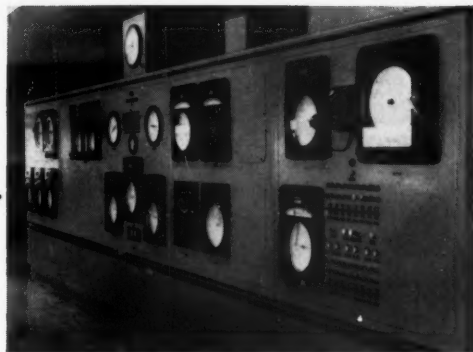
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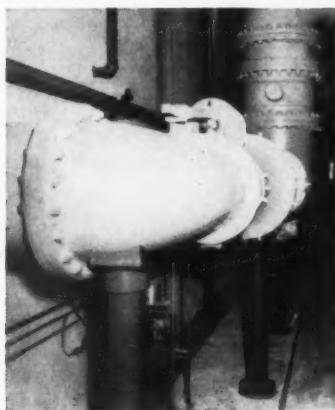


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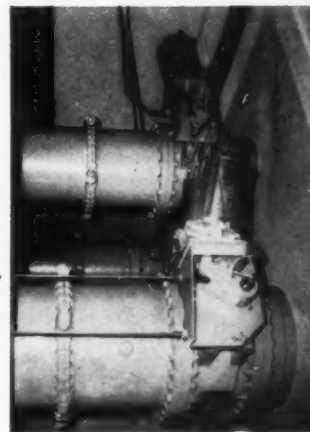
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Builders Master Control Panel serves as centralized information center for operating entire plant. Panel provides supervisory control of well field, indicates all flows entering and leaving plant, indicates amount of chemicals being fed, and pressures both at plant and in downtown area.



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Compact Builders rubber-lined AWWA Butterfly Valves are equipped for both automatic and manual emergency operation . . . have many exclusive design features for efficient "bubble-tight" operation.



Readers' Comment

Editorial Helps

Sir:

The Missouri Association of Consulting Engineers thanks you for your well worded Tranquil Tower editorial in the CONSULTING ENGINEER September issue "Competition — Fair and Phony." It has been most helpful in crystallizing our thinking on the issue of concealed engineering charges.

Your editorial will help us greatly in our continuing consideration and combating of the unethical practices of concealing charges for professional services.

Bengt F. Friberg, Secretary
Missouri Association of
Consulting Engineers

Education Needed

Sir:

Comments "From the Editor's Tranquil Tower" in the August 1959 issue of CONSULTING ENGINEER, brand the Canons of Ethics, that are supposed to apply to engineers, as nearly worthless.

Your reference to the Ten Commandments being the only code of laws that has stood the test of time cannot be disputed — but did you ever try to control traffic on a busy street by applying only the Ten Commandments?

I believe it is true that engineers consider themselves independent individuals, but so do drivers on a busy street. For the driver there

must be rules other than the Ten Commandments, or street traffic would be in chaos. For the engineer, who may also know something about the Ten Commandments, the Canons of Ethics are actually the rules that apply to his "driver" conduct. In both cases the rules can and must be changed as the need arises. If the Canons are now weak, some attention should be directed toward strengthening them rather than damning them because they are imperfect, unless, to quote an engineer of our acquaintance, "We can't be ethical and live."

Your conclusion regarding the decision of the Board of Ethical Review of the National Society of Professional Engineers for Case Number 58-1 is particularly disturbing. The fact that the action of the government employee in question was unethical you do not stress too seriously but you do stress that the particular offense was not specifically covered in the Canons of Ethics. The most important fact is that an unethical act was committed, not that the Canons should be abandoned because they do not include this particular offense.

Your suggestion that a Joint Board of Review be established, with EJC and NSPE the working force, may have some merit, but while the idea is being developed would it not be a good idea to support a campaign of education — inform engineers again and again what our ethics are supposed to be, rather than condone individual interpretation or condemn the Canons for dealing in platitudes and trivia? Education is a step toward avoidance of unethical acts, and far more desirable than prosecuting an offender after the act has been committed. Yet education, relative to

ethics, is a subject avoided by editors, society officers, and individual engineers. We wonder why.

Harold E. Smith, P.E.
Wyomissing, Pennsylvania

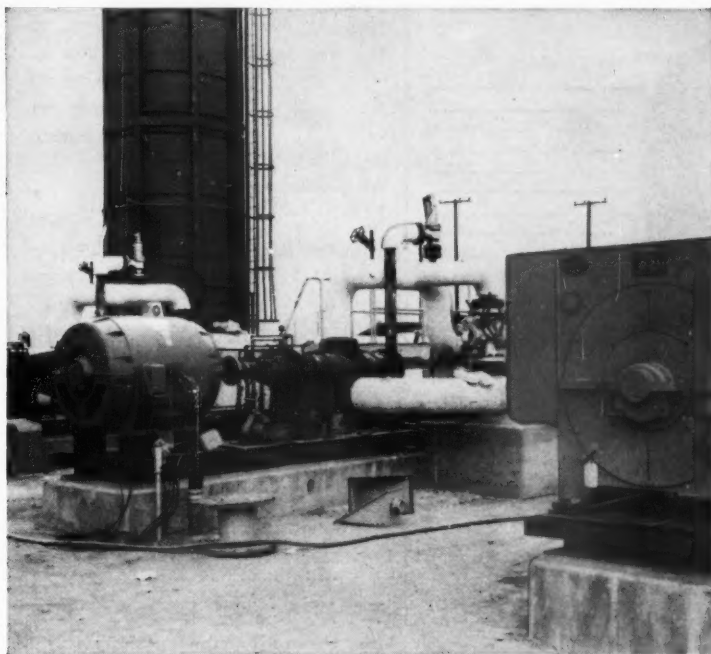
Ackerman Replies

Sir:

I found the comment by Dean Hesse in the September issue of CONSULTING ENGINEER very interesting. However, I suspect that Dean Hesse has not taken time out to carefully study the report of the ASCE Task Committee on Professional Education. Although I had the privilege of serving as chairman of that committee, I feel obliged to call attention to the dedicated work of its seven members over a period of four years. One of the questions discussed in some detail is how to get started on the revision of present-day engineering curricula. If students are expected to acquire the basic characteristics of an engineer in terms of imagination, vision, initiative, and pioneering instinct, then there is very little justification for a curriculum based on the minimum standards of the majority. The individual student today can design his curriculum and start "engineering his own career" by opening the catalog of any good university. This trend can be accelerated by interest and encouragement on the part of faculties and practicing engineers.

Although many papers have been written on the topic of "technicians" versus "engineers" it is difficult to give a higher rating to the young engineering graduate who is unable to write a clear exposition on our American system of government or on our free enterprise system. It is astonishing to find how many engineering students fail in this respect, partly due to lack of

Banish Costly Enclosures



Save on Outdoor Motors by Specifying Silicone Insulation

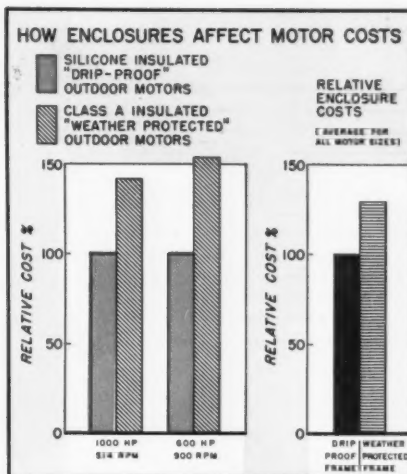
Dramatic proof of size and weight savings made possible by motors with silicone insulation systems is demonstrated by these outdoor direct coupled pump drives at the Alamitos Steam Station of Southern California Edison Company. Here, self-protecting silicone rubber insulation means substantial dollar savings in enclosure cost for the smaller, open frame motor.

Both motors have 400-hp ratings. The difference in weight between the two motors is well over 1,000 pounds. Why is one motor so much larger than the other? Because the smaller Allis-Chalmers motor has a self-protected Silco-Flex insulation system incorporating Silastic®, the Dow Corning silicone rubber. The other motor is insulated with conventional materials requiring the protection of a more elaborate enclosure.

Despite its much smaller size, the silicone insulated motor also has a 15% service factor not found in the larger unit. This extra cushion against overloads assures greater reliability and longer life for the smaller unit.

Silicone rubber insulated motors for pump drives, fan drives, or other applications can withstand torrential rains, corrosive fumes, fly ash, dust, salt air, snow, sleet, cold, heat . . . even flooding! That's why it's wise to specify motors with insulation systems made from Dow Corning Silicones for greater reliability and maximum savings.

For more information, write Dept. 1023.



Savings of 30% and better result from specifying motors with insulation systems made from Silastic. Silicone rubber produces a homogeneous, resilient insulation system unaffected by heat, cold, moisture, abrasives, many chemicals and corrosive atmospheres. No need to buy expensive enclosures. Insulation systems made of Silastic are self-protecting, permit open enclosures outdoors where weather-protected frames would otherwise be required. There's no need for a premium priced enclosure to protect the insulation.



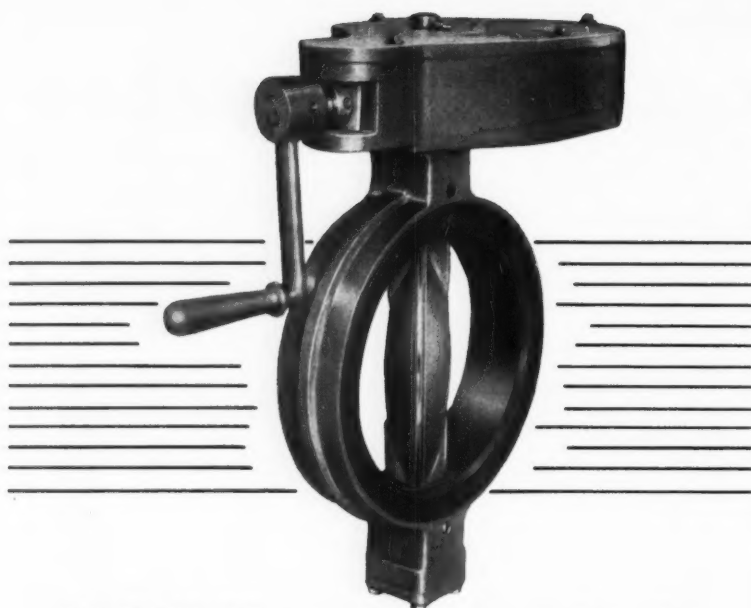
What's more, Silastic's extra thermal capacity provides motors, transformers, and other equipment with additional service factor for absorbing overloads. These motors—with a generous service factor built-in—add immeasurably to reliable service . . . operate more economically.

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NEW! Monoflange valve is guaranteed drop-tight at 150#

The Henry Pratt Monoflange MK II is a top quality butterfly valve that fits between the pipe flanges of a fluid or gas line. **It saves weight, space and labor** because it eliminates a pair of flanges and requires only one bolting operation. **It eliminates gaskets** because the faces as well as the inside of the valve body are covered with rubber permanently bonded to the metal.

Low torque makes the Monoflange easy to operate, especially with Henry Pratt's new **SIDEWINDER manual operator**. Any type of power operator can be used if desired. Structural features include streamlined disc, one piece shaft, chevron packing and Nylon bearings. Various materials available for corrosive liquids.

Standardized and mass produced, this new valve offers famous Henry Pratt quality at a new low price . . . you can't find a similar valve that offers so much in quality or performance.

Complete information available. Water and gas flow data, valve sizing, operator selection in 26 page brochure. An ideal tool for the engineer working with and specifying valves. Write for Bulletin 10 J

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RUBBER SEAT BUTTERFLY VALVE

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training in sound economics, or partly due to contact with unsound "modern" textbooks in economics, or due to the fact that technical subjects have crowded this area of training out of the curriculum of the four-year standardized course.

A. J. Ackerman
Consulting Engineer
Madison, Wisconsin

Misplaced Credit

Sir:

In your September issue, the picture of Warren Hospital on page 103 under "Hospital Structural Engineering" should have given credit to Sigmund Roos who designed the structure rather than me. I hope it may be possible to print something that will give Sig proper credit.

Samuel A. Bogen
Consulting Engineer
New York, New York

. . . Replaced

Sir:

Please note that on page 103 of the September issue of CONSULTING ENGINEER, under an article on "Hospital Structural Engineering," credit lines are given for the architect and the mechanical and electrical engineers, but the structural engineer's name was omitted.

You guessed it! The structural engineer was none other than —

Sigmund Roos
Consulting Engineer
New York, New York

More on Computers

Sir:

A number of consultants expressed their opinions on the use of computers in consulting firms in the "West Coast Report" in September.

We have had a Bendix G15 computer for over a year and a half, and have logged about 5700 hours on it. As we are civil engineers, most of our computer work has been done in this field.

Since we lease our own computer, we find that it is always economical to use it on a problem if we have a program that will

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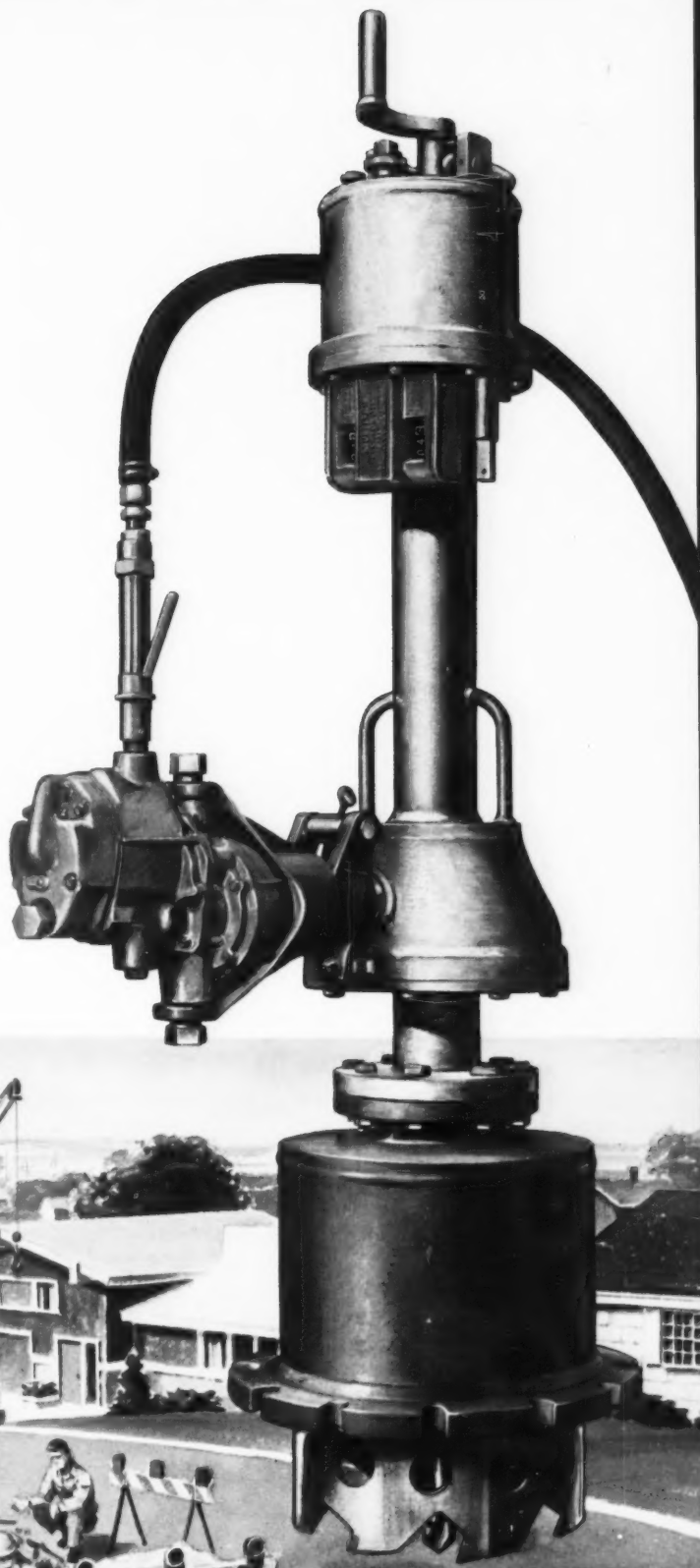
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Today, because of the dependable performance of the thousands of products developed by Mueller people for the water and gas industries, the constant, safe control of gas and water is taken for granted.

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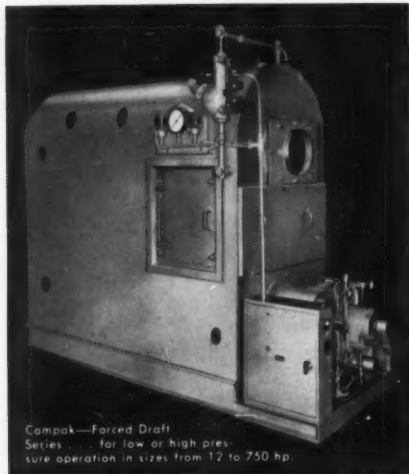
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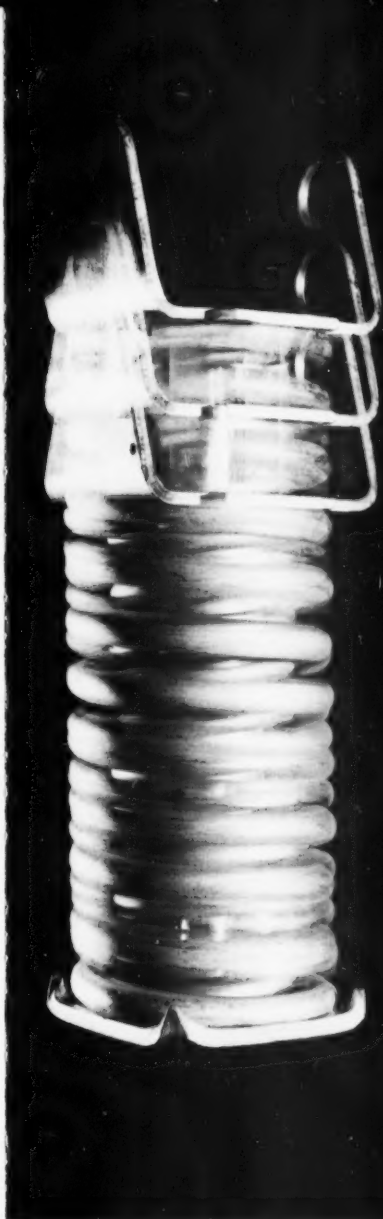
fit. If there are no programs available, we have to estimate our cost of writing the program, and compare this against the possible savings and potential usage of the program. This is different for each program, and would vary from firm to firm. There is no question that the computer is economical on any problem for which a good program exists. Sometimes the first programs of a group, including our own, are so poor that they are really not very economical. However, this situation is usually soon rectified.

Our decision to lease the computer was based on several factors. We had several large computer jobs to do, and there was no satisfactory computer service available at the time. Certainly one guide for a new user as to whether he should lease a computer is when his bills from service bureaus exceed the cost of having his own.

Our best problems for computer applications have been traffic analysis, certain hydraulic studies such as reservoir studies and backwater curves, and analysis and design of standardized highway bridges. These all meet the requirement of either numerous problems of the same type or a large amount of computations for one problem.

It does not appear to us that the computer will in any way limit the advancement of young engineers. In fact, in freeing them of laborious computations it will allow them more time to gain professional experience. We feel that Dr. English's 80 percent by the computer is a long ways off. As it stands now, there is very little structural analysis being done by computers, and it will require a great deal of time and programming before any large amount can be done. Assuming that the computer does do all of the structural analysis, there will still be a large amount of professional engineering to do on any structure.

Paul E. Potter
Tudor Engineering Company
San Francisco, California



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or**



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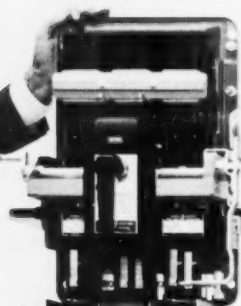
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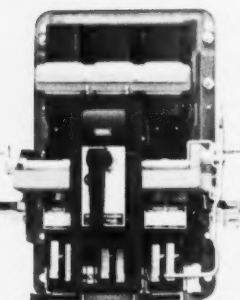


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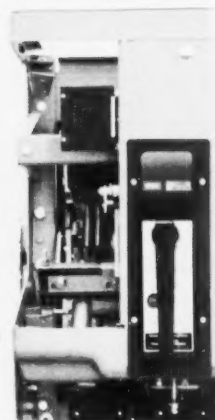
AK-2-15
MANUAL

225 AMP



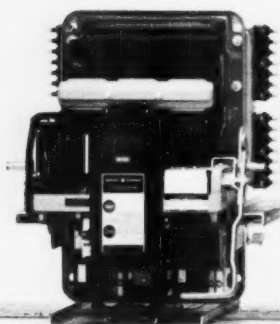
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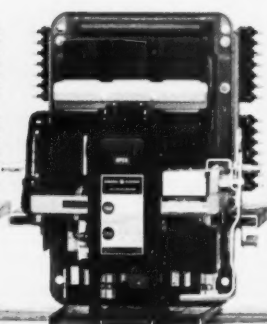


NEW
AK-2-500
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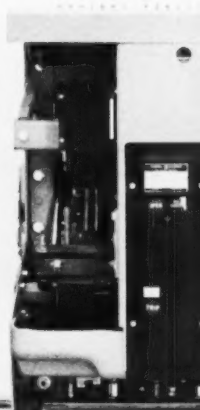
1600 AMP



AK-2-15
ELECTRICAL

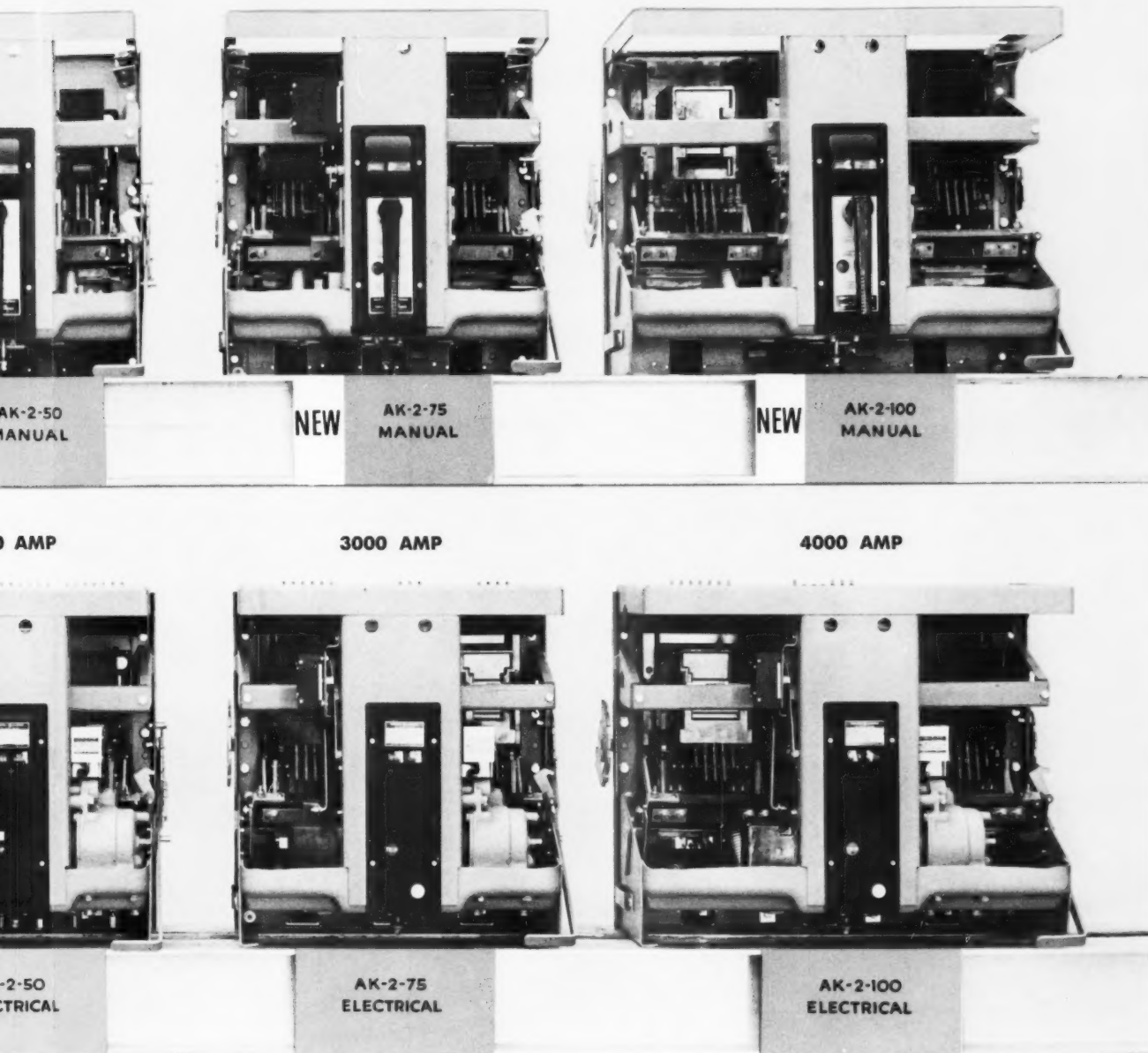


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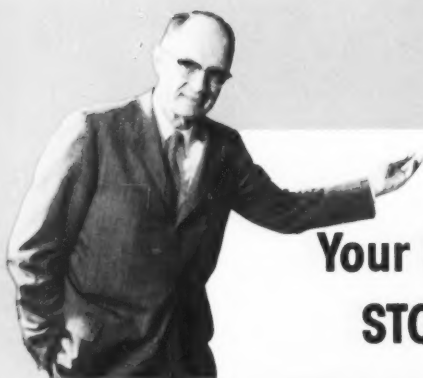


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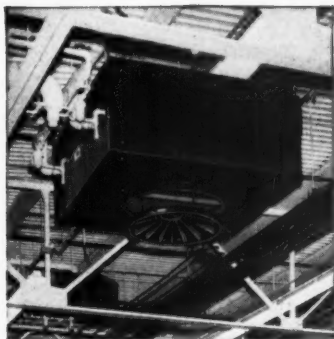


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integral curb flanges — internally braced hoods to withstand heavy snow loads and hurricane winds — coated with thick cork-impregnated asphalt for corrosion resistance. High efficiency "Buffalo" Fans move maximum air per horsepower. Write for Bulletin FM-2345.

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Akron's 7-story Carlton House to be cooled with individual Arkla-Servel units



Harry Sugar (left), one of the builders, and designer Matthew J. Rosenstock

*Individual **GAS** units to cool and heat new \$2 million apartment house*

Akron's luxurious Carlton House will mark the largest use of individual gas air conditioning units in a single apartment house.

Summer cooling and winter heating will be provided for the suites by 58 three-and-a-half and five ton Arkla-Servel Sun Valley gas air conditioners.

The Arkla-Servel gas air conditioning units were chosen after serious consideration of all types available. The designer insisted that each apartment have individual thermostat control as well as individual installations to eliminate the need for large compressors and any possible vibration. Because gas is also used for cooking as well as heating and cooling, there was no need for installing heavy cable, either.

The Arkla units will be installed in the utility rooms of each suite. Four small water towers, located on the roof, will provide condensing water for the system. The water will be constantly recirculated, thus keeping its cost at a minimum.

Check the facts and you too will see that modern Gas air conditioning out-performs all others. For specific details call your local Gas Company's air conditioning specialist, or write to the Arkla Air Conditioning Corporation, General Sales Office, 812 Main Street, Little Rock, Ark. *American Gas Association*

*for Cooling, **GAS** is Good Business*



From the Editor's **Tranquil Tower**

UNTIL QUITE RECENTLY, it was the custom for governments to close up shop for the summer. Not only did all the Congressmen, M.P.s, and Ministers go back to their constituencies, but even the little people seemed to disappear to make room for tourists and ladies' auxiliaries on convention. This was true not only of London and Paris but of Washington. Henry Adams said that he always left Washington in May and seldom returned before the middle of September. In this, as in most matters, Mr. Henry Adams was wise.

But looking back at this past summer's activities, we can not object to the big events or the way the big people behaved. It is not for us to analyze the effects of the Khrushchev visit, nor are we suggesting that the Algerian situation would have been better handled if de Gaulle had respected tradition and let Paris sleep during August. We do not even say that Macmillan was wrong in calling for a late summer election. No, it is not the summer activities of the great men that worry us, but rather, those of the little people.

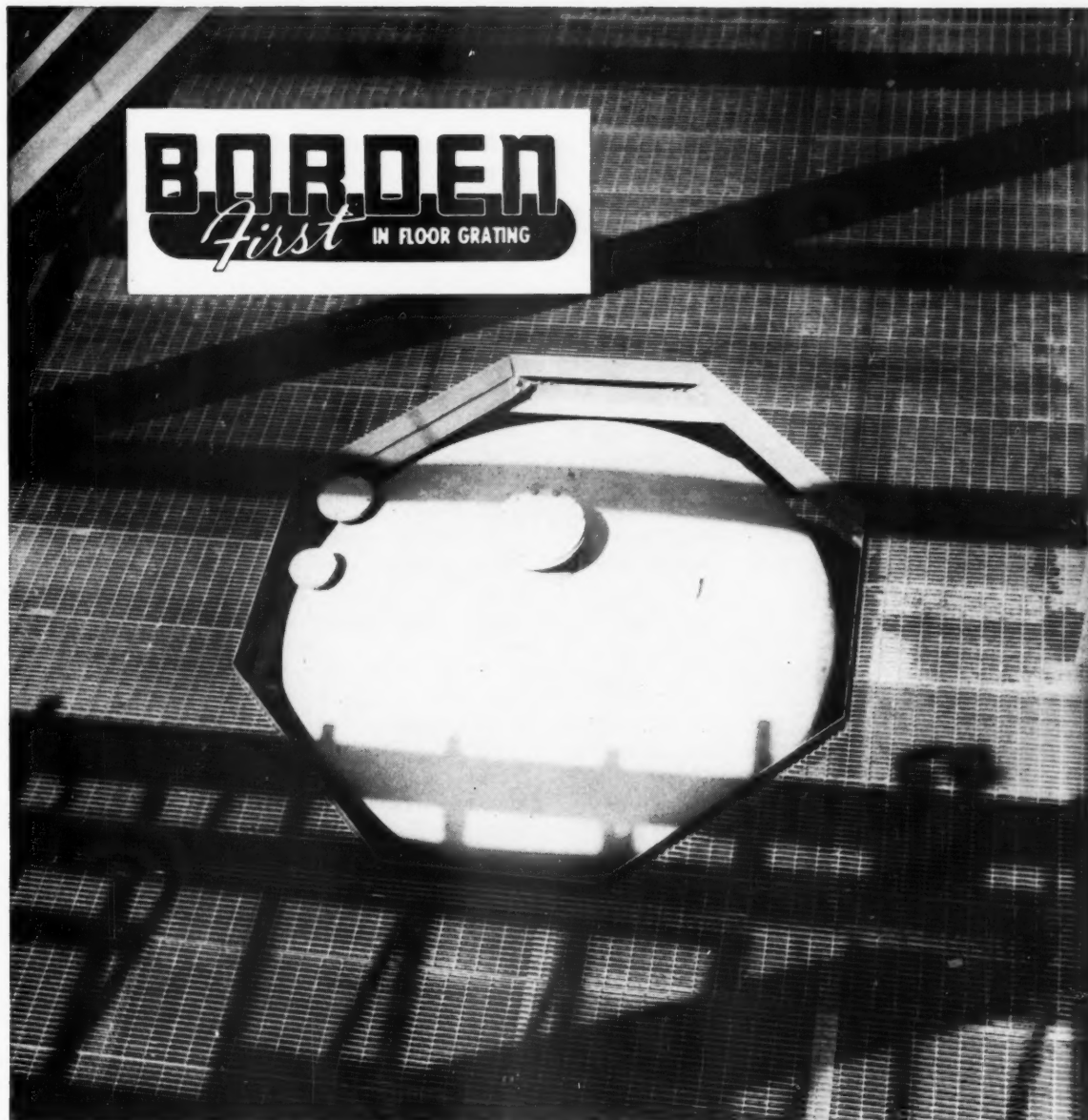
Based on the record of this past summer, we strongly recommend that all the little people of Washington follow the example of Mr. Adams and leave in May, returning no earlier than the middle of September. We believe this rule should apply to Congressmen, bureau chiefs, and all civil servants except those directly assigned to guiding visitors through the public shrines. As they leave for Peoria and Passamaquoddy, it is only logical that they should be followed by all the non-government little people who are in Washington to deal with them.

For the little people were at their worst this past summer. Looking back at some of the scenes from Washington's midsummer melodrama it is easy to see what can happen to logic when the relative humidity and the temperature both rise to the high 90s.

The House Appropriations Committee, reporting on funds for the Department of the Interior for 1960, recommended that a maximum of 5 percent be put upon fees paid for engineering work. While this proviso finally was removed, the Committee threw in several warnings about "excessive engineering and design costs." Strangely, this excessive cost referred to fees paid consulting engineers rather than to the cost of comparable engineering work when done by the engineers of the Department of the Interior. Yet, the latest available figures would seem to indicate that engineering work done by the employee engineers of the Department of the Interior cost about three times the 5 percent suggested as a maximum to be paid to consultants. Only excessive summer heat could explain the logic that would limit consultants to a 5 percent fee while failing to even mention the 15 to 20 percent that it costs the Department of the Interior to do its own engineering with its own government employee engineers.

Unfortunately, this estimate of 15 to 20 percent of construction costs, as the cost of engineering when done by employees of the Department of the Interior, is only a hopeful guess. Congress quite carefully looked into the cost of engineering when done by consulting engineers, but seemed to have practically no interest in the cost of engineering when done by government employees.

The next sign of summer madness came in the hearings on funds for the civil functions of the Army as conducted by the House Subcommittee on Public Works Appropriation. Here again, Congress carefully investigated the size of consultant fees on work done for the Corps of Engineers. They found, as might have been expected, that consulting fees averaged somewhere between 3 and 4 percent of construction costs on major projects. There is nothing secret about this, for the Corps of Engineers makes use of a fee curve to establish the amount they will pay for engineering done by consulting engineers. The House Subcommittee showed great interest in these fees and asked the Corps of Engineers why they were wasting this money when they could have been doing this engineering work themselves. It never occurred to the Subcommittee, apparently, to see what the cost of engineering was



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when performed by the Corps' own engineers. Again, it seems likely that the cost would run somewhere between 15 and 20 percent, but Congress apparently does not care about that.

The next attack on the consultant during this past summer's campaign came from the Comptroller General in his report to Congress on the Audit of the Bureau of Public Roads. The Comptroller General complained about the use of fees based on percentage of construction cost for highway work. He pointed out that a percentage fee encourages engineers to prepare elaborate designs and expensive projects in order that they may increase the construction cost and hence their own fees. The Comptroller General also objected to lump sum fees and cost-plus fees. To put it succinctly, it appears that the Comptroller General objects to any kind of fees at all. In view of this, it is interesting to note that in 1946 the average fee paid by a state highway department to consulting engineers was 4.4 percent. In 1957 this dropped to 3.75 percent. This seems quite reasonable to us, and at this rate, it is quite likely that some consultants are even losing money on certain jobs.

It is to be noted, again, that all the emphasis has been placed upon a determination of fees charged by consultants, and no mention whatsoever is made of the cost of comparable highway engineering when done by employees of state highway departments. All through this whole summer, the implication seems to have been that it costs nothing to do engineering if you use government employees. None of these government investigating or reporting groups have made any attempt to determine what the real cost of government engineering is. Most of those involved in these affairs even seem to be ignorant of the damning figures published five years ago by one of the Task Forces of the Hoover Commission. It will be recalled that with the single exception of the Atomic Energy Commission (which during the year the figures were compiled had most of its engineering work done for it at cost-plus \$1), the cost of engineering by government agencies ran anywhere from two to five times the cost of having the work done by a consulting engineer.

It is unfortunate that we have to waste the taxpayers' money not only on excessively expensive government engineering, but also on investigations of agencies of the government that saved money by using consulting engineers.

Summer madness is not, however, limited entirely to government people. The engineering societies and associations also seem to have been hit by the heat. The frequent recurrence of Congressional reference to "excessive engineering fees" seems to have upset several of these groups, and they have all jumped into the saddle only to ride off in dif-

ferent direction to see what data they can collect to refute the critics.

Consulting Engineers Council, despite the fact that it conducted a similar survey a year ago, is again making an effort to collect some statistics from its members to indicate what they have been receiving for work on government projects.

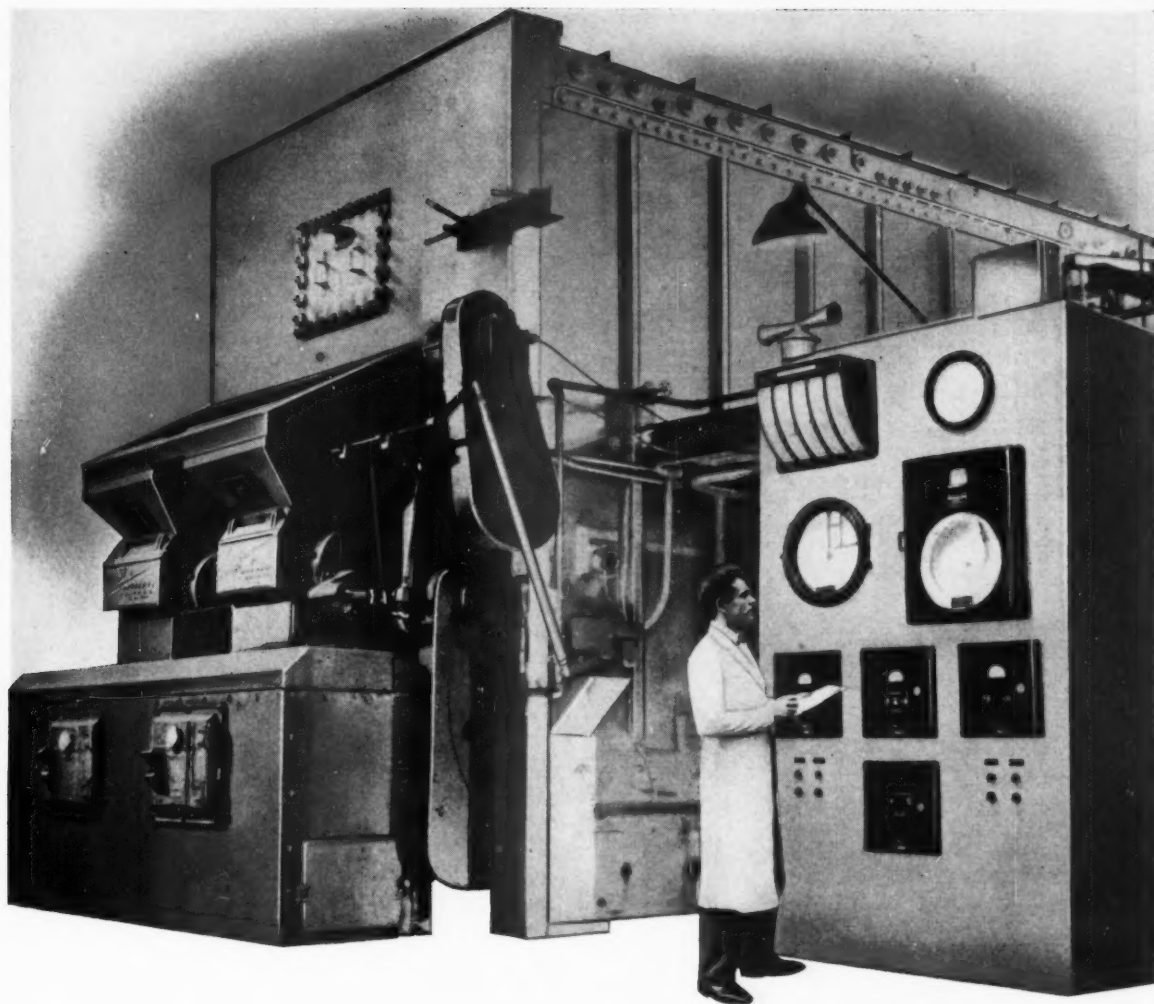
NSPE has sent out a huge packet to consulting engineers containing a two-page letter, a reprint of a magazine article, a legal-size 1000-word instruction sheet, a sample of a filled-out form, and eight blank forms. The purpose of this questionnaire is to collect "an overwhelming, indisputable volume of facts . . . comprehensive in scope to show irrefutable facts regarding fees actually paid to consulting engineers by Federal agencies for various types of engineering services."

This effort amazes us. What can possibly be determined by all of this data accumulation and form filling out? The only information that consulting engineers could possibly supply has to do with their own charges, and so far as we can see, there never has been any question about this. Each agency of the government knows exactly what it pays consulting engineers, and is not trying to hide this information. The only data that would appear to be hard to collect would be that having to do with fees paid by the individual state highway departments and the Comptroller General has been kind enough to gather that. The point is that there is no question about fees paid to consulting engineers. No one is even quibbling about that. The real point is, what does government engineering cost when done by government employees?

It seems to us that instead of wasting their own time and money and the time and money of their members, these organizations should bear down on the government agencies and find out what their engineering costs amount to. There is no need to make consulting engineers fill out thousands of hour's worth of forms to provide figures that can be had by a phone call made to the right man in a government agency.

It is very important that Congress and all of its interested committees and subcommittees be shown that engineering work can be done more economically by firms of engineers than by government employees, but it must be understood that the important and as yet undetermined figure is that of the cost of government employee engineering. There is no need to make extensive surveys to find out what consultants charge. That is already known.

We hope that as summer passes and autumn clears the fog from the Potomac, some of the cool wisdom of winter gradually may return to Washington. It is needed if this important matter is to be settled in a sensible manner. ▲▲



Now a stoker fired steam generator with the advantages of a heat engineered "package"

The same engineering excellence that gives standard Foster Wheeler oil and gas fired steam generators their convenience, dependability and economy is built into this new, stoker-fired packaged unit.

It is designed for semi-automatic operation, comparable with the newest gas and oil fired packaged steam generators. The push of a button can bring it on or off a banked fire. The firing front can be converted for oil firing over a weekend. Shipment in three major sub-assemblies materially reduces the amount of labor as compared to field erection of coal burning steam generators of similar capacity.

In brief, this new packaged steam generator is everything you would expect from the company that originated the "steam package concept". In a series of exhaustive

tests, the new unit has exceeded all expectations for capacity and efficiency.

If you are in an area where coal would be your most economical fuel, you will find it well worth your while to get full information on Foster Wheeler's new stoker fired packaged steam generator before writing specifications for any new steam generating installation. It is available in three standard sizes: 43,000 lb, 50,000 lb and 63,000 lb of steam per hour at 250 psi. Or, if an oil or gas fired unit would be more suitable, get specifications on Foster Wheeler's full line of packaged steam generators in capacities from 13,000 lb/hr to 100,000 lb/hr.

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NEW YORK LONDON PARIS ST. CATHARINES, ONT.



RESISTS OILS! RESISTS MOISTURE! RESISTS FLAME! RESISTS ACIDS!

**See how Rome Synthinel 901... a special cable insulation...
resists resists resists almost anything that threatens wiring!**

Oils... acids... alkalis... grease... gasoline... weathering...

This unique PVC cable insulation—Rome Synthinel 901—resists almost every type of corrosive attack!

It's even resistant to flame! Where higher than normal heat conditions exist, you can use Synthinel 901 for its superior heat-deformation resistance. You can even use it to replace varnished cambric insulation on oil-filled transformer leads, where the leads are constantly immersed in hot oil!

WHAT IT IS

Rome Synthinel 901 cable insulation is a synthetic thermoplastic compound consisting mainly of polyvinyl chloride resin mixed with appropriate plasticizers, stabilizers and reinforcing agents.

ELECTRICAL PROPERTIES

Electrically, Rome Synthinel 901 has such attractive properties as high dielectric strength, complete resistance to corona or ozone, and good insulation resistance. It has good aging characteristics and is considered a long-life insulation under almost any operating conditions.

COLOR CODING

You can get Rome Synthinel 901 in 13 solid colors. Further color coding is obtainable by the use of spirally applied colored surface stripes or other approved methods. Rome

Synthinel 901 insulated wires and cables are generally small in diameter with a smooth, glassy, well-lubricated surface—easy for you to handle!

APPLICATION

You can get Rome Synthinel 901 for operation at maximum temperatures of 60, 80, 90 and 105 C., depending upon the installation



and the conductor size, designated by Underwriters' Laboratories, Inc. You can install it at minus 10 C. and, in some cases, lower temperatures.

Rome Synthinel 901 is particularly recommended for building wire types, control cables, appliance wires, cords, as well as power cables and outdoor and street lighting cables. Its application is generally limited to 600-volt operation, except for outdoor and street lighting service, and it is suitable for direct earth burial, raceway or open wiring installation.

Get more information, including lab test results, on Rome Synthinel 901 from your Rome Cable salesman. Write for free literature.



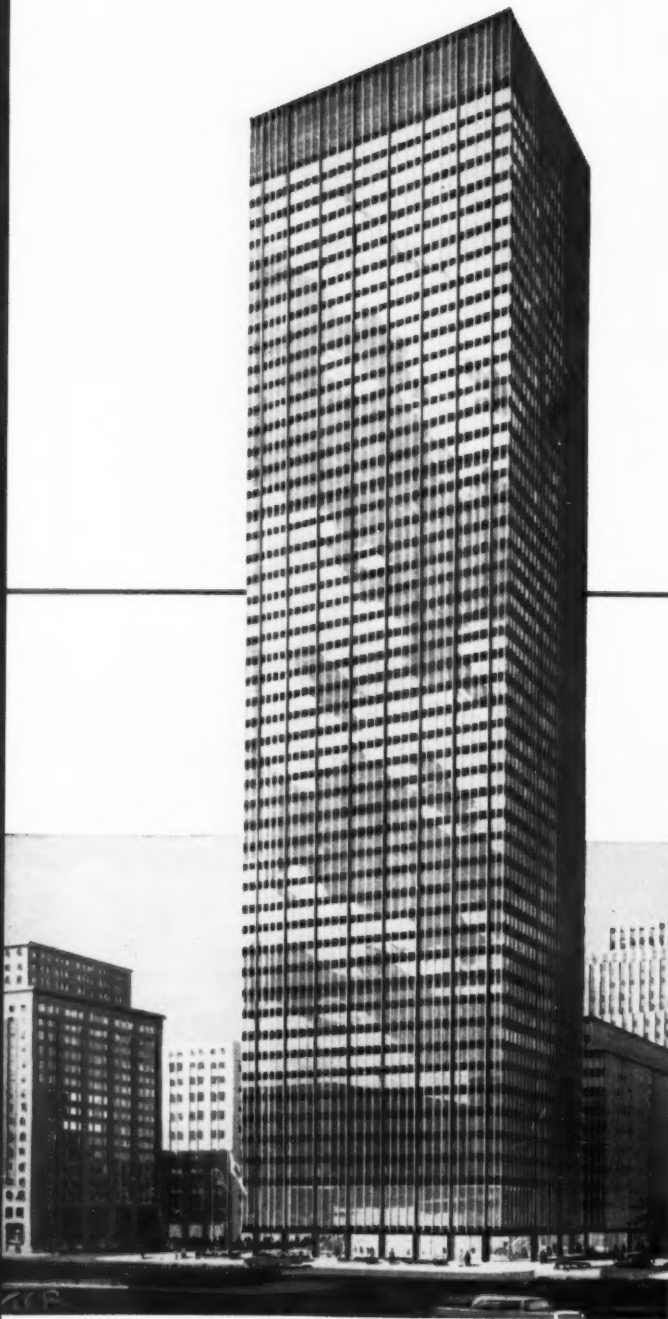
ROME CABLE DIVISION OF ALCOA

Concrete work in is reinforced with

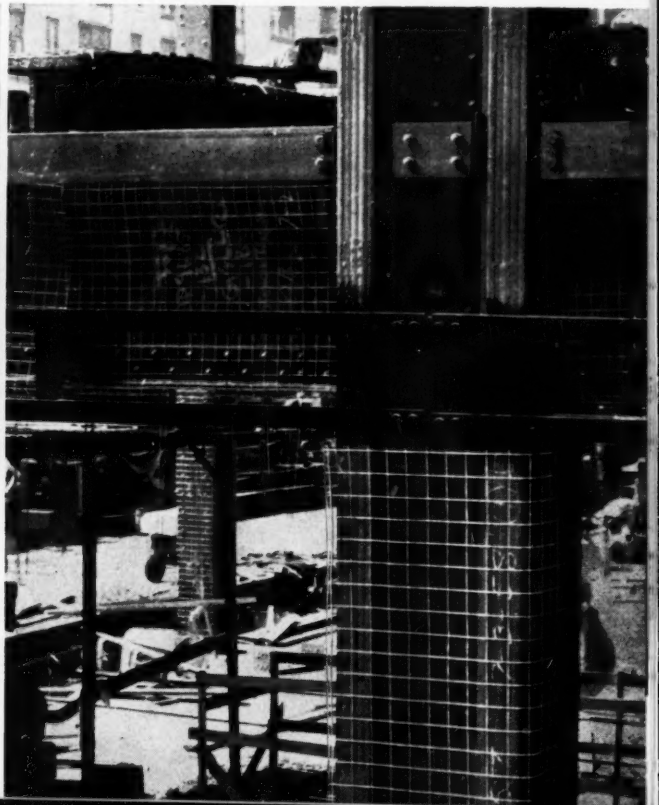
JUST north of Grand Central Station a new skyscraper is rising to join New York's storied skyline. It is the 52-story Union Carbide office building. During the razing of the Hotel Marguery, formerly on the site, and the erection of the new skyscraper, Grand Central trains operated below—on time, without interruption.

USS American Welded Wire Fabric was used throughout this building to add strength and durability to concrete work. To meet the differing requirements of

USS American Welded Wire Fabric style 22-1212 was used to reinforce the thin layer of concrete encasing the structural steel for fire protection. The closely spaced small members of fabric ideally suit it for this reinforcement to prevent crack-causing stresses due to temperature changes and structural deflection. The fabric readily shapes to the steel and retains its rigidity in the bent form. Large sheets can be applied to speed construction.



Architect:.....Skidmore, Owings & Merrill
Consulting Engineer:.....Weiskopf & Pickworth
General Contractor:.....George A. Fuller Company
Concrete Contractor:.....Knickerbocker Construction Company
Fabric Distributor:.....Carroll-McCreary Company, Inc.



new Union Carbide Office Building

American Welded Wire Fabric !

concrete slabs, fills and fireproofing, three USS American Welded Wire Fabrics—of varying weights—were used.

American Welded Wire Fabric has long been used successfully and economically in practically every form of structure. It has an enviable record of successful structural application in the world's tallest and largest buildings. For more information on American Welded Wire Fabric, write to American Steel & Wire, 614 Superior Avenue, N. W., Cleveland 13, Ohio.

USS and American are registered trademarks

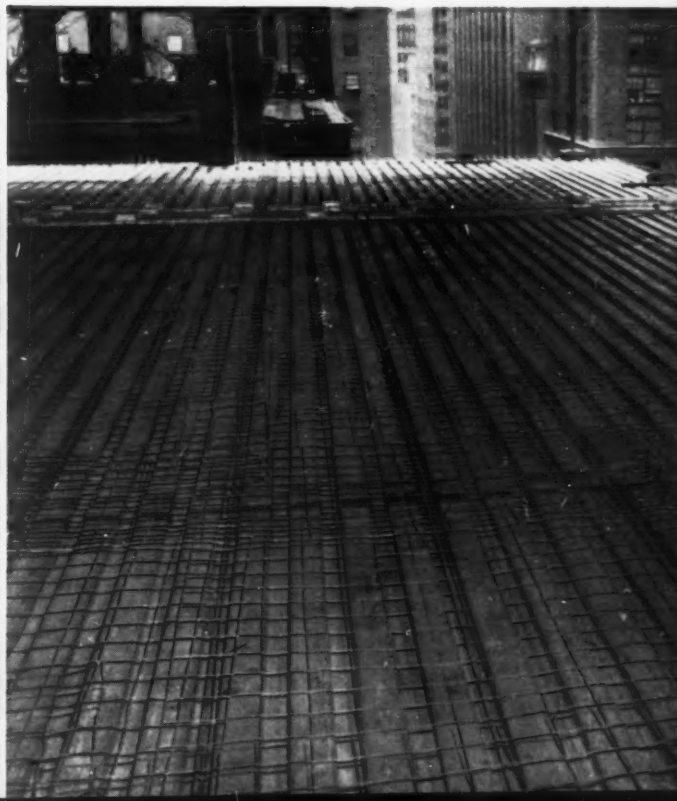
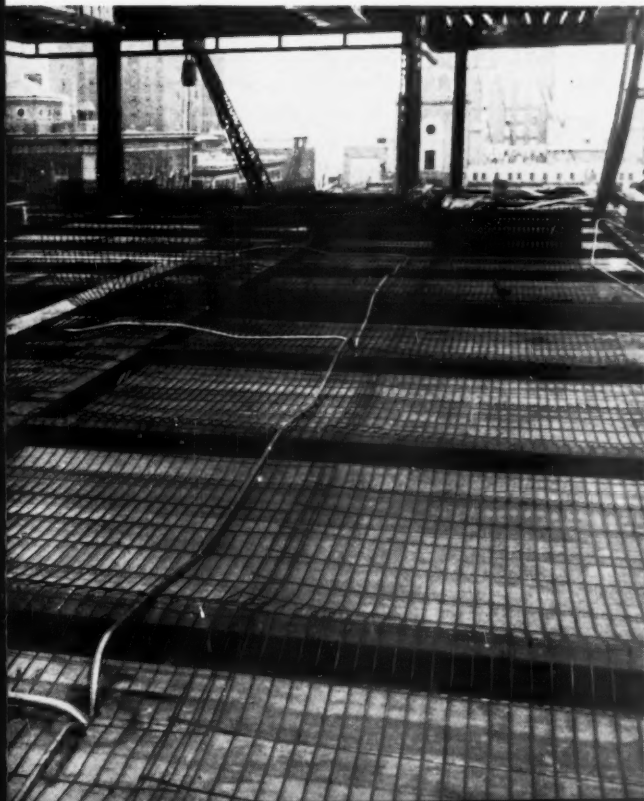


**American Steel & Wire
Division of
United States Steel**

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad

Short span concrete slabs are structurally reinforced with a rectangular style of USS American Welded Wire Fabric. The high yield point of the cold-drawn wires permits higher working stress, thus reducing the amount of steel to be handled and installed. It is easily draped and placed at points of maximum stress due to positive and negative movement. Long fabric rolls speed installation and assures continuity of slab action through continuous reinforcement.

The designers and owners specified that distributed reinforcement be used in the concrete fill over cellular metal decking to prevent temperature and shrinkage cracking. USS American Welded Wire Fabric style 44-1212 was selected. The small diameter closely spaced wires provide the needed protection against unsightly cracking.





**FIDIC's Dutch
Secretary**
(Front Cover)

The Readers' Guide

The first consulting engineer from outside the United States to appear on a cover of this magazine was the late Robert Naef, of Zurich. He was at that time (1955) the president of the International Federation of Consulting Engineers (FIDIC). A year later, in 1956, Julian Tritton, of London, who had just succeeded Mr. Naef as the head of FIDIC, appeared on our cover. The only other non-U.S. engineers we have carried were Mr. Thomas N. Arnold, then of Auckland, New Zealand, but since moved to Canada, Mr. John G. Frost and C. C. Parker, both of whom have been in Canada all along, and one cover shared by Johannes Rosenthal of Berlin and Armend N. Tourne of Brussels. Now, we add to this short but growing list, Ir. H. Rusting, secretary of FIDIC, and consulting engineer of The Hague, Holland. In CONSULTING ENGINEER's interview with Ir. Rusting, he spoke of FIDIC's recent growth, the part the Consulting Engineers Council (U.S.) and the other new members will play, and the plans this international organization has for the future. As the world gets smaller, U.S. consulting engineers will find that more and more of their projects ignore national boundaries. FIDIC, therefore, is becoming a vital professional organization.

In 1950 the average office area was designed for a lighting level of about 30 foot-candles. Now, less than 10 years later, 70 foot candles would be considered about right. Lighting authorities insist that this lighting level will go even higher next year and the year after. There is, however, one serious drawback. More light means more heat, and this typical office with its increased lighting level, now requires an extra ton of refrigeration for every 1000 square feet. This is a serious matter for owners of yet to be designed buildings. This air conditioning just to handle the heat from the lights is an unattractive cost item, and engineers are expected to keep it to a minimum. Ernest F. Siegel, of Green Associates, Inc., consulting engineers of Baltimore, has some ideas about cost cutting in this area. His suggestions make it possible for owners to get increased lighting levels without excessive heat loads.

**When Tax
Supported**
(page 120)

When a tax-supported institution such as a hospital, penal institution, or a school considers the installation of service facilities (laundries, power generation, water supply) to handle requirements that could be provided by outside organizations, the economic justification involves some rather complicated accounting. Gordon W. Neal, of Consoer, Townsend and Associates, Chicago, has had experience in this field of engineering-economics, and he points out for our readers some special considerations involved in this type of engineering accounting.

The first large under-river tunnel in the world was completed in 1843. It was the tunnel under the Thames from Wapping to Rotherhithe, designed by Mark Brunel and built largely under the supervision of his son, Isambard K. Brunel. The project was a difficult one, and its history, as written by F. C. Livingstone, a British engineer, makes fascinating reading. Despite all the troubles, the job obviously was well done, for the tunnel still is used as a part of London's underground tube system.

**Master
Specifications**
(page 130)

The preparation of a good master specification is a major undertaking, best approached gradually, according to Hugh C. Carter, of Hugh Carter Engineering Company. He tells, in an article in this issue, how he has developed master specifications for the use of his firm — and his experiences can guide other consultants around some of the pitfalls of this type of project.

Bright But Cool
(page 114)

The Thames Tunnel
(page 134)



Required lighting reading: G-E Ballast Application Guidebook

Q. What's the average ambient sound level in a typical classroom?

A. 25 TO 30 DECIBELS. You'll find this and 1001 other lighting answers in General Electric's new Ballast Application Guidebook. The book is designed specifically to simplify proper selection of ballasts for all standard applications. More than 100 pages long, it's organized for fast loose leaf reference right at your desk or board. No other single source has these advantages.

THE COLORFUL, ILLUSTRATED MANUAL first reviews the leading principles of ballast specification. Then it lists—by application—recommended ballast-lamp combinations, with performance characteristics of appropriate General Electric ballasts. G-E prices and ratings, and general information are filed in the rear of the Guidebook. Price of the book is \$5, and includes periodic revisions and additions.

SPECIFY LIGHTING FASTER AND BETTER with the first comprehensive reference—General Electric's Ballast Application Guidebook. 401-70

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Send me copy(copies) of the Ballast Application Guidebook, GIZ-964. Bill me \$5 per copy, and send all subsequent revisions and additions at no charge.

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According to an old (and possibly Russian) proverb, there are more ways of killing a cat than choking it with hot butter. So, it seems, there are more ways of reducing heavy machinery vibration than cutting the incoming power lines. A much more logical method, frequently applicable, is the chemical injection of the soil below the machinery, thereby stabilizing it and changing the natural frequency of the vibrating system. The theory and two examples of practical applications are discussed in this issue by Wiss, Zurbrigen, and Gnaedinger, engineers of Chicago.

**Stabilizing
Machinery
Foundations**
(page 126)

**Flat Plates
Flat Slabs**
(page 110)

E. Vernon is the Konkell of Ketchum, Konkell & Hastings, of Denver. He (and his partners) are well known as experts in the design of concrete structures. In an article in this issue, he discusses the design and supervision of construction of structures using flat slabs and flat plates. A careful reading of his article will eliminate a lot of difficulties and disappointments when working with the thin concrete sections typical of this approach to building design.

The Economist is a distinguished and respected British publication with some considerable circulation in business and political circles in the United States. *Time* quotes from *The Economist* so frequently that a wag recently remarked that a subscription to *The Economist* is all that is required to qualify as a London correspondent for *Time*. This British publication has been around for a long time. It was founded in 1843. Every issue (it is a weekly) carries a One Hundred Years Ago column from its own pages. It was then, as it is now, an independent journal of opinion. It does not follow any "line." Instead it examines thoroughly each political event or financial affair and then clearly and intelligently speaks its piece. Just as *The Economist* has reporters and correspondents all over the world gathering political and financial news, so do writers for its subsidiary, The Economist Intelligence Unit Ltd. collect information of interest to special groups. (There is an interlocking directorate made up largely of knights, earls, and viscounts.) Some of their reports are syndicated, some are prepared for exclusive publication. CONSULTING ENGINEER has arranged for The Economist Intelligence Unit Ltd. to prepare a series of exclusive feature articles for our readers. These will deal with conditions of private practice in various countries or with particular items of current interest to consulting engineers. Political, financial, and professional matters will be emphasized. The first of the series published in this issue deals with Italy. It explains the special problems of Italian engineers in private practice and suggests some of the difficulties that may arise when Italy becomes one of the Common Market Nations. CONSULTING ENGINEER is proud to be able to publish for our readers these exclusive reports resulting from our new association with The Economist Intelligence Unit Ltd. — and its parent, *The Economist*.

**New Series
From An
Old Source**
(page 140)

Domes
More Domes
Most Domes
(Next Month)

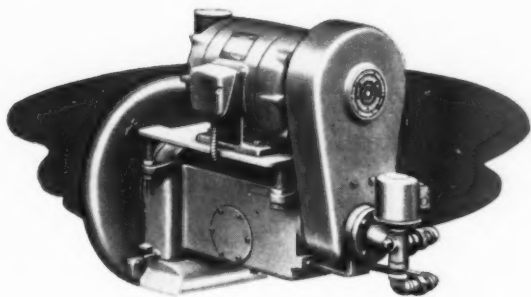
Next month (December) CONSULTING ENGINEER will publish another Special Report. Our last Special was "Hospital Engineering" in September; this next will be on "Domed Structures." When the editors decided on this as the topic, there was some feeling that there were too few of these domes and not enough to say about them to make a full report. There is, of course, the dome housing the American Exhibit in Moscow, the huge Union Tank Car dome in Baton Rouge, and the Kaiser dome in Hawaii — but are there others? It did not take much investigation to find more domes. Every few minutes another important domed structure was added to our list. Now it seems there is no end to it; there are domes everywhere. Our major problem is condensing all the important material we have collected on structural, mechanical, and electrical engineering for domes. To top it off, R. Buckminster Fuller, the world's acknowledged authority on domed structures, has prepared an introduction that is a comprehensive study in itself. The readers of CONSULTING ENGINEER may find it controversial technically, but it is interesting and thought provoking.

ALL PACKAGED BOILERS ARE NOT THE SAME



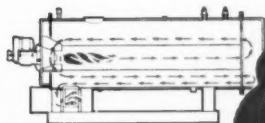
IS IT A TRUE PACKAGE ?

Superior Packaged Boilers are complete . . . including burner, draft equipment, controls and all interconnecting piping and wiring. Completely factory assembled, and fire-tested at the factory before shipment.



IS IT ROTARY-BURNER EQUIPPED ?

This is important for fully-automatic operation. The Superior Burner is capable of starting a cold boiler without compressed air, requires a minimum of supervision, and no lubrication whatsoever.



*4-pass design
5-square feet*

IS ITS HEATING SURFACE ADEQUATE ?

Most boilers have adequate heating surface when new. Its effectiveness is lessened, however, as the boiler is used. To insure against this, look for a full five square ft. per boiler horsepower, and Superior's 4-pass, down-draft design.

CHECK THESE IMPORTANT FEATURES

before you buy...

There's a big difference in package boilers, that is not always obvious from external appearances. In the first place, many of the so-called packages are not packages at all, but combinations of boiler on the one hand and a burner-draft-control package on the other, shipped from separate manufacturers and assembled as a unit at the installation site.

Even in the true packages there are important differences in burner equipment, draft arrangements, and in the actual rating of the boiler itself.

Superior Packaged boilers are true packages, fully assembled and fire-tested at the factory before shipment. They are equipped with dependable Superior Rotary Burners, induced draft, integrated controls, and all interconnecting piping and wiring. They are conservatively rated, based on a full 5 sq. ft. of heating surface per boiler horsepower.

The location of the furnace within the boiler shell is carefully planned to provide protection against both low-water and mud-buildup failures.

Ask your engineer about Superior Packaged Boilers, his counsel is your best assurance of a boiler which will provide years of dependable operation at high efficiencies.

Type C Superior Packaged Boilers are manufactured in fourteen sizes, from 20 to 350 bhp., and with slight design modifications to 600 bhp. Sizes above 350 bhp. are designated as Type CF. All sizes are fully automatic firing oil, gas or both, and for pressures to 250 psi. Hot water units are also available. For complete information write giving capacity range desired, and ask for bulletin 13C.



Specialists in PACKAGED BOILERS... exclusively

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SUPERIOR
PACKAGED BOILERS

Exciting design ideas with POZZOLITH concrete...

New Denver church demonstrates the structural versatility of POZZOLITH concrete

Grace Lutheran Church—a new shape for reverence

Precast-concrete supporting bents, tilt-up wall panels of light-weight concrete and poured-in-place roof and end walls all combine in this new "church for today"—demonstrating the exceptional versatility of POZZOLITH concrete. Concrete was chosen as the logical building material to blend soaring traditional church styling with modern design simplicity.

Smooth, clean surface-textures and good density with no cracks were readily obtained with POZZOLITH—as were the high early flexural strengths needed for tilt-up construction. Construction costs of Grace Church (\$12 per square foot) demonstrated the economy of architectural concrete.

To better meet concreting requirements on your projects—call in the local Master Builders field man. He'll demonstrate how concrete produced with POZZOLITH becomes a more versatile and more useful building material . . . superior in performance, in quality and in economy to plain concrete or concrete produced with any other admixture.

The Master Builders Company, Cleveland 3, Ohio

Division of American-Marietta Company

The Master Builders Company, Ltd., Toronto 15, Ontario

International Department, New York 17, N.Y.

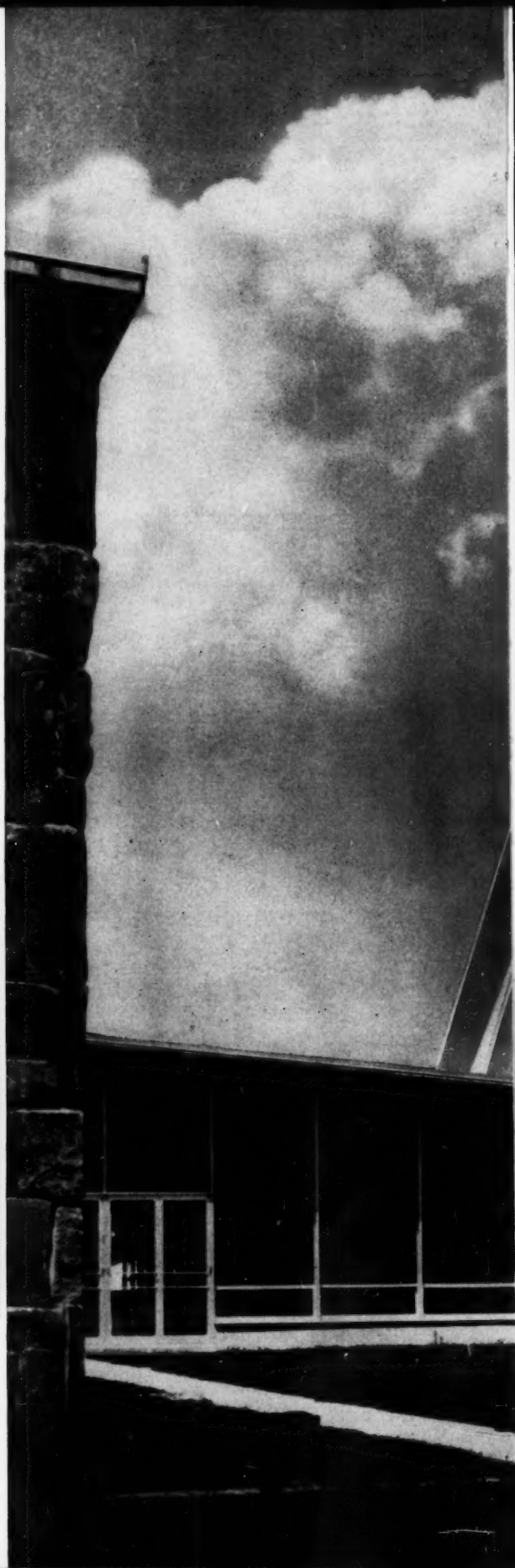
Branch Offices in all principal cities.



SPACE AND LIGHT . . . are subtly balanced to achieve a spiritual atmosphere. The exposed concrete interior provides both excellent acoustics and appearance. The church seats 600.

MASTER BUILDERS. POZZOLITH*

*POZZOLITH is a registered trademark of The Master Builders Co. for its concrete admixture to reduce water and control entrainment of air and rate of hardening.





GRACE LUTHERAN CHURCH . . . recently completed \$110,000 contemporary church — part of a \$350,000 church-and-school building program. Architects: Baume and Polivnick, A.I.A. • Consulting Engineer: Ketchum and Konkell • General Contractor: Lippert Brothers • POZZOLITH Ready-Mixed Concrete: Ready-Mixed Concrete Co. of Denver — all of Denver, Colorado.

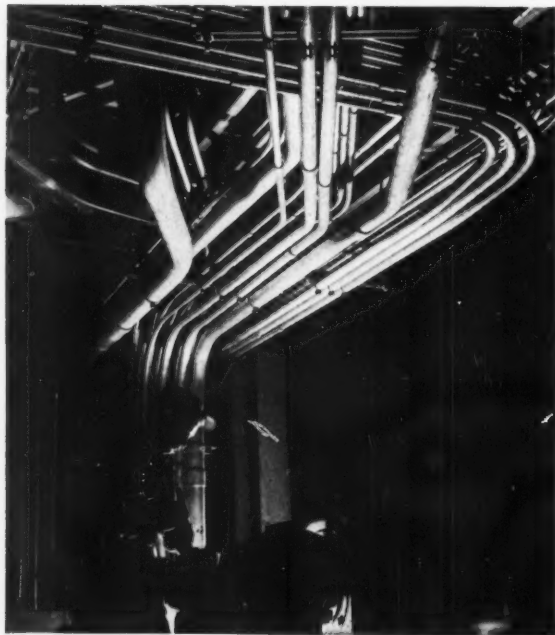
LIGHTWEIGHT KAISER ALUMINUM RIGID CONDUIT reduces handling and installation costs

WEIGHT COMPARISON, ALUMINUM VS. STEEL

U.L. required minimum weight per
100 ft. including couplings, lbs.

Trade Size, Inches	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6
ALUMINUM	27.4	36.4	53.0	69.6	86.2	115.7	182.5	238.9	287.7	340.0	465.4	612.9
STEEL	79.0	105.0	153.0	201.0	249.0	334.0	527.0	690.0	831.0	982.0	1334.0	1771.0

This chart shows 66% reductions in the weight of aluminum conduit as compared to steel conduit. Result: easier handling, reduction in worker fatigue, lower labor costs.



CHECK the chart . . . aluminum conduit weighs only *one-third as much* as steel conduit!

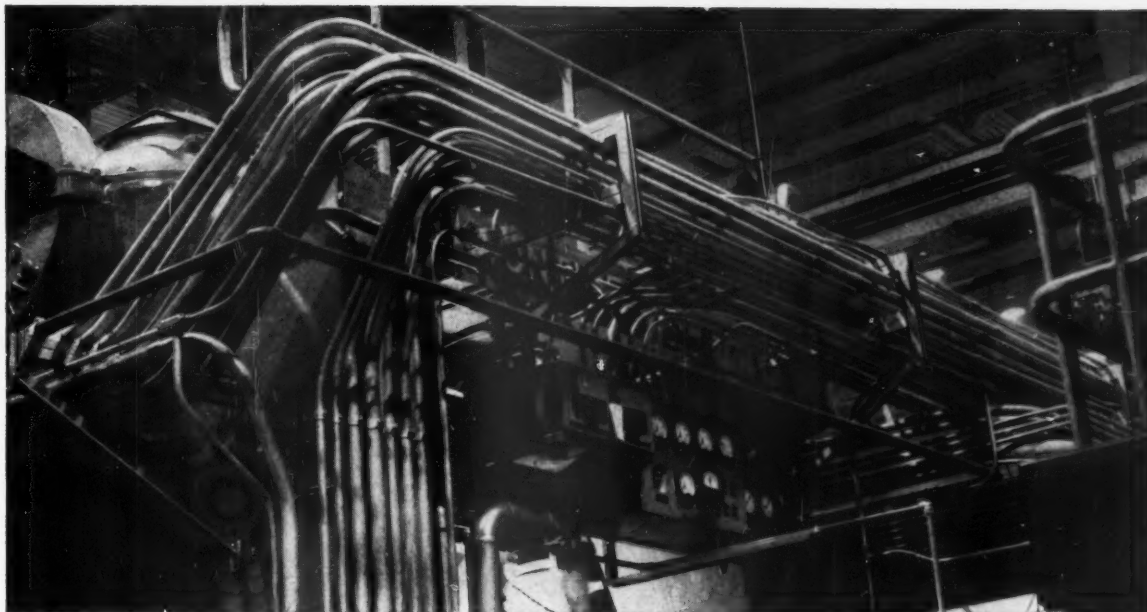
This lighter weight pays off in faster installation with less worker fatigue. Result: lower installation costs . . . with savings up to 50% in some cases!

And here's another cost-saver: lightweight aluminum conduit requires fewer hangers or supports. For large cable-conduit feeders in sizable groups or banks, the number of supports can be greatly reduced. Definite labor savings can be made, especially where supports must be installed in masonry with star drills.

Aluminum conduit's lighter weight pays off in lower handling costs too. For example, standard 10-foot lengths of 3/4" steel conduit, usually delivered in groups of five, weigh 53 pounds delivered. Similar aluminum conduit, *delivered in groups of ten*, weighs only 37 pounds.

Corrosion Resistant To Cut Maintenance Costs

The excellent resistance of aluminum to atmospheric



and chemical corrosion has been proved by numerous and extended exposure and laboratory tests, and by countless applications in the process industries.

Aluminum's ability to resist corrosion means that maintenance is virtually eliminated. No painting is needed. Replacement costs are held to an absolute minimum.

And, since aluminum can't rust, cost economies can also be realized in storage. No special storage preparations are necessary.

Nonmagnetic To Reduce Voltage Drop

Because aluminum conduit is nonmagnetic, it is not subject to magnetically-induced energy losses.

This reduction of energy loss permits a longer run of cable without exceeding the voltage drop as specified in the National Electrical Code. In some installations this will permit the use of a smaller size conductor and conduit.

A further advantage is that each conductor in

either a single-phase or polyphase system can be enclosed in a separate aluminum conduit, regardless of electrical load. Separate rigid conduits greatly simplify installation of electrical equipment having widely spaced terminals. Terminal overcrowding is eliminated.

Get ALL The Facts Now!

We will be glad to send you an informative 9-page magazine article entitled "Now We Can Specify Aluminum Conduit."

This article contains a complete run-down on the advantages of using aluminum conduit—comparative conduit weights, comparative labor cost charts, installation facts, and much more valuable information.

We'll also send our *Aluminum Rigid Conduit* brochure, with installation data, specifications and availabilities for Kaiser Aluminum rigid conduit.

Get *all* the facts about aluminum rigid conduit and how it can save you money. Mail the coupon now!



IF IT CARRIES CURRENT, ~~K~~W CARRIES IT!

See Aluminum Conduit featured on "Maverick"



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Electrical Conductor Division
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Please send your *Aluminum Rigid Conduit* brochure and aluminum conduit magazine article.

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Good fabrication and welding properties of "T-1" Steel saved time and money in the shop and on location.
Owner: The Washington Water Power Company. Engineering: Ebasco Services, Inc. Scroll cases: Chicago Bridge & Iron Co. Turbines: Allis-Chalmers Co. General contractor: Morrison-Knudsen Co.

USS® "T-1" Steel cuts weight of biggest turbine scroll cases 50%

A SCROLL CASE looks like a giant sea shell. Water gushes into it from a high level reservoir. Through the conch, the water swirls in an ever-tightening spiral into the blades of water turbines. Because the cross section of the spiral passage diminishes, the water pressure and velocities are built up for efficient power generation. Four of these scroll cases, the largest in the United States, have been built from USS "T-1" Steel by the Chicago Bridge & Iron Company. They are installed in the Noxon Rapids Dam, an \$87 million project now under construction by the Washington Water Power Authority to harness the waters of Clark Fork River. The dam is located on the site of a prehistoric lake in western Montana.

Because of the fierce pressure and

erosive action of the water, it was obvious that a very strong, abrasion-resisting steel was required. USS "T-1" Constructional Alloy Steel not only met these requirements, but permitted a reduction of about 50% in plate thickness.

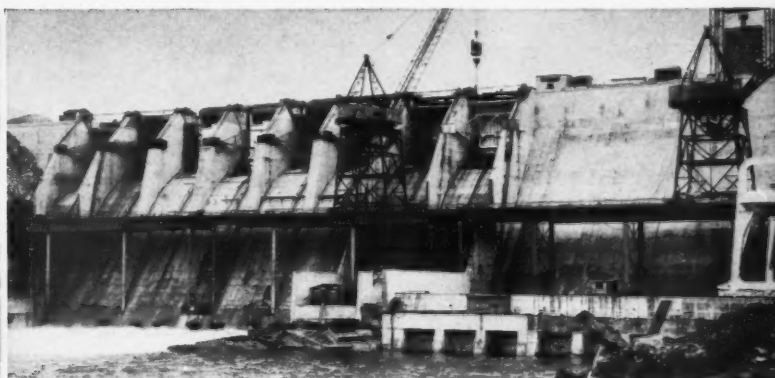
COST SAVINGS. By using USS "T-1" Steel, there was substantially less weight of material to ship across the country. Weld time and weld metal were reduced. Foundations could be made smaller.

This job points up the economies possible with the use of USS "T-1" Steel: lighter weight, greater strength, weldability and resistance to impact abrasion. Write for our "T-1" Steel book containing complete information. United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

USS and "T-1" are registered trademarks



Scroll cases built with USS "T-1" Steel to obtain maximum strength with the least weight. Largest diameter is 24 feet with a speed ring about 28 feet in diameter.



Noxon Rapids Dam a new \$87,000,000 power project by the Washington Water Power Company to harness the waters of Clark Fork River in western Montana.

United States Steel Corporation - Pittsburgh
Columbia-Geneva Steel - San Francisco
Tennessee Coal & Iron - Fairfield, Alabama
United States Steel Supply - Steel Service Centers
United States Steel Export Company

United States Steel



150,000

90,000

135,000

217,000

300,000

125,000

160,000

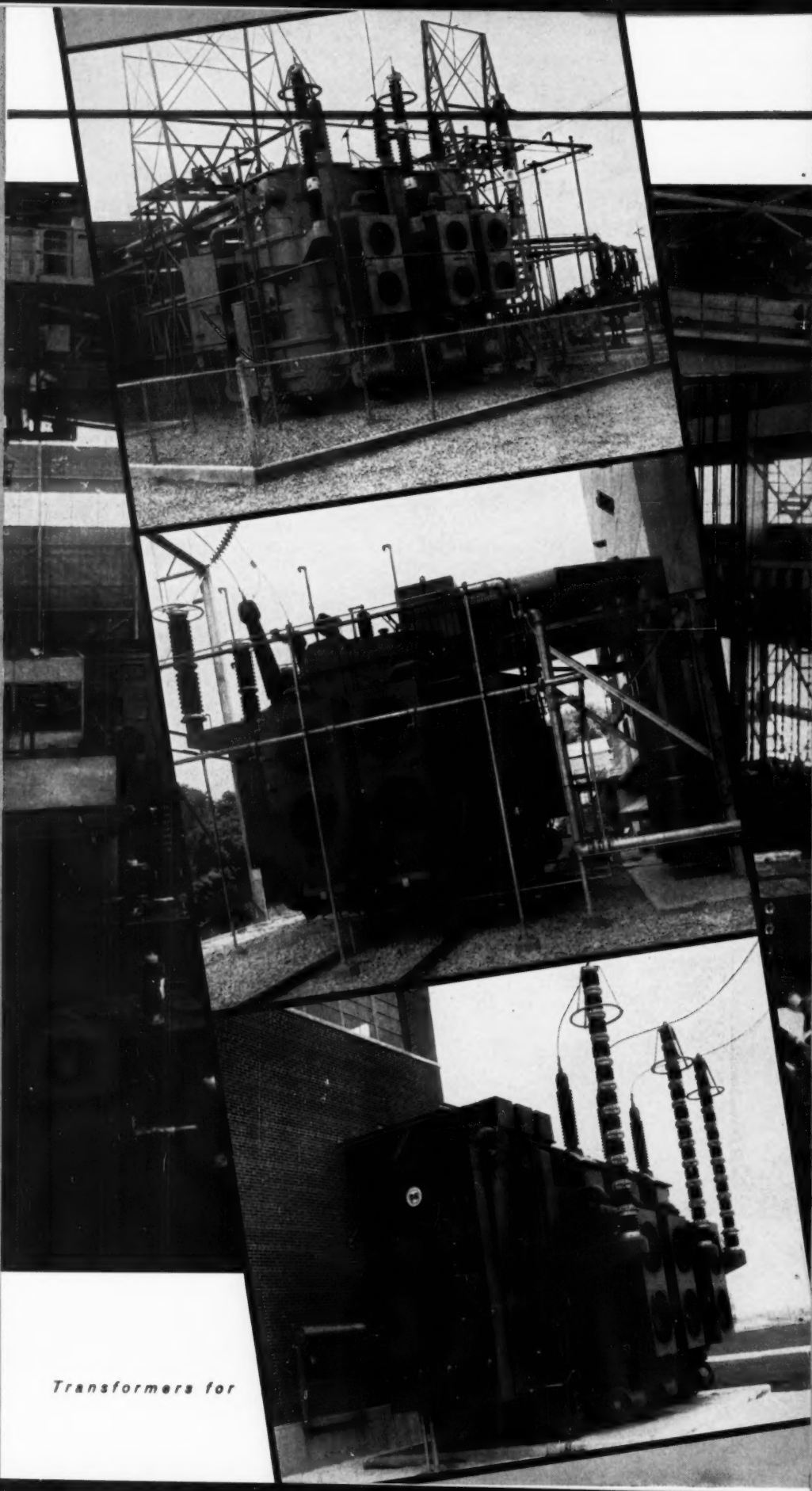
96,000

75,000

200,000

100,000

230,000



Transformers for

— THE NUMBER YOU PICK . . .



depends on carefully calculated system requirements of present and future loads. So too, must the manufacturer of power transformers be chosen, carefully . . . and with an eye to the future.

To this end, careful consideration of Moloney Electric Company's qualifications will reveal these facts:

- Sixty-three years experience in designing transformers of all types and sizes.
- Modern, extensive facilities with the capacity to produce transformers of any size or rating.
- Unexcelled product operating records.
- Continuous research and development to improve transformer design and manufacture.

This ability to design and manufacture efficient, dependable transformers of any rating is a carefully calculated result of Moloney planning and preparation.

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Report from the West Coast

RALPH S. TORGERSON

West Coast Editorial Representative

FORMED ONLY a few months ago ("Report from the West Coast," CONSULTING ENGINEER, June 1959), the Consulting Mechanical Engineers Association of Southern California already has gone into action in Los Angeles at hearings before a committee of the City Council on the proposed Heating, Ventilating, and Air Conditioning Code. The position of the new association favoring the ordinance was expressed in an opening statement made by Ralph Westcott, past president of the Consulting Engineers Association of California and currently president of the Consulting Engineers Council.

Proposed Code Discussed

A section of the proposed code would require the signature of a registered mechanical engineer on certain plans and specifications. The Southern California Chapter, AIA, voiced objections to this section, stating that as prime contractor it had the responsibility for the design, and this provision would take away its authority and responsibility.

Other groups represented at the hearing favoring the registered mechanical engineer signature requirement included: Mechanical Contractors Association, California Society of Professional Engineers, Los Angeles Fire Department, American Society of Mechanical Engineers, Associated Plumbing Contractors, Consulting Electrical Engineers, and Structural Engineers Association of California.

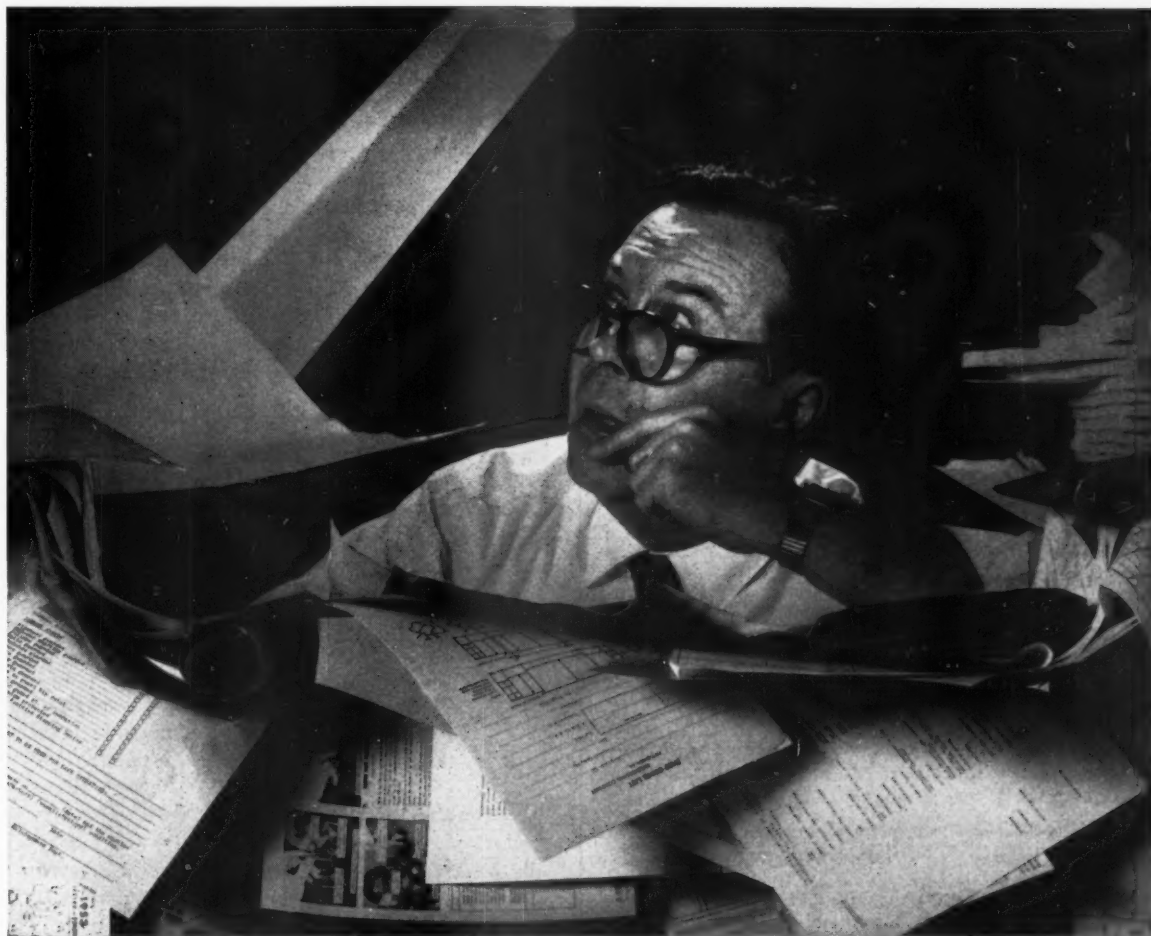
President J. Marx Ayres of the Consulting Mechanical Engineers Association took the stand that the architect's signature alone on a complicated set of mechanical plans and specifications was not sufficient. He pointed out that while the architect by tradition had been exempted from the licensing provision of the California Civil and Professional Engineers Act, Section 6737, that this blanket exemption was not valid today. President Ayres con-

tended that although the architect is qualified to sign the mechanical plans and specifications to certify that these plans and specifications have been coordinated with the entire project design, he is not by training and experience qualified to ascertain the correctness of the very complex mechanical designs of the air conditioning systems to be regulated by the proposed code. He held that the licensed mechanical engineer is directly responsible for the preparation of the plans and specifications, is the only one qualified to certify for their correctness, and therefore must sign them.

Architect's Obligation

"We do recognize," said Ayres, in a statement addressed to the California Chapter, AIA, "the architect's legal obligation to an owner as the prime contractor and owner's representative; also the architect's prerogative to have his firm name and signature on all drawings emanating from his office. However, where the engineer, either in the architect's direct employ or by specific contract, designs a mechanical system for the architect, the architect needs the licensed mechanical engineer's signature on mechanical plans and specifications for his own protection. The signature of a non-qualified party may designate a responsible party but carries no assurance as to the correctness of the documents." This correctness of design and its importance to public safety was emphasized at the public hearing by Chief Ray Hill of the Los Angeles Fire Department.

Ayres further pointed out that most architects and owners today insist on using the services of licensed mechanical engineers, on projects of the size to be regulated by the new ordinance. Those that do not are a very small minority. Ayres disagreed with the view that the new ordinance would



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SWP-21

create hardships to any substantial portion of AIA membership as there are plenty of licensed mechanical engineers in the Los Angeles area available to serve the architects.

In an effort to come to some amicable agreement on the new Los Angeles Code, a committee has been set up by the Los Angeles Chamber of Commerce representing both architects and engineers. The committee includes William T. Wright, of the architect-engineer firm of Kistner, Wright and Wright, as chairman; C. Day Woodford, of Woodford and Bernard, architects; and Ralph Westcott, Holladay and Westcott, mechanical engineers.

Membership Defined

The new Consulting Mechanical Engineers Association has nearly 50 firms represented in its membership with a mailing list of about 80. There are two grades of members: firm members and general members. As stated in the bylaws, membership is open by invitation to any individual who is licensed to practice professional engineering in the State of California as a mechanical engineer, is engaged in such practice through the medium of a legally constituted sole ownership, partnership, or corporation, and has as his principal source of earned income the practice of the profession. Architect-engineer offices are included. Although there is no limit to the number of individuals of a sole ownership, partnership or corporation that may hold membership, only one from each firm may be designated as a firm member to cast votes upon certain designated matters before the membership. A general member may be designated as an alternate for a firm member for voting purposes.

Standing committees have been set up, but only interim reports have been made to the association up to this time. The committees are studying fees and contracts, standards of engineering services, codes and standards, and employee relations.

CEAC Has New Secretary

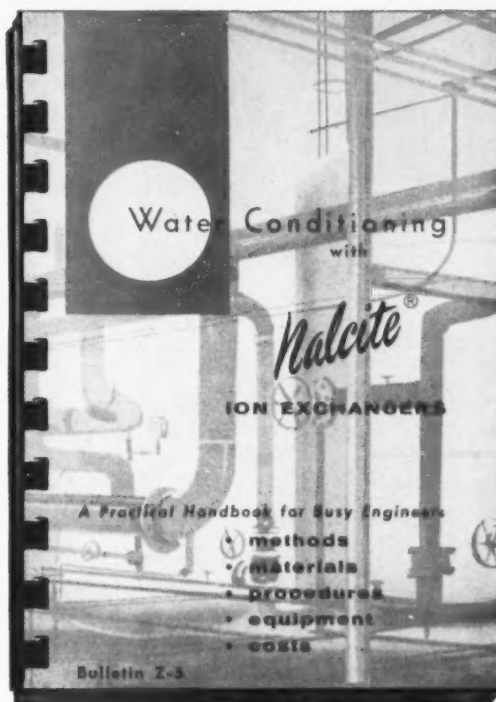
At the September meeting in San Francisco, President John Blume introduced Raymond C. Kelly as the newly appointed executive secretary of the Consulting Engineers Association of California. Mel Doernhoefer, who had been serving as acting secretary-manager since the death of Pecos Calahan, has returned to Chicago to head the national Home Show activities of the Home Builders Association with which he was formerly identified.

Kelly received his mechanical engineering education at Purdue University and the University of Arizona, and has had 15 years experience in engineering construction followed by 10 years in association management. He is a member and past director of the American Society of Association

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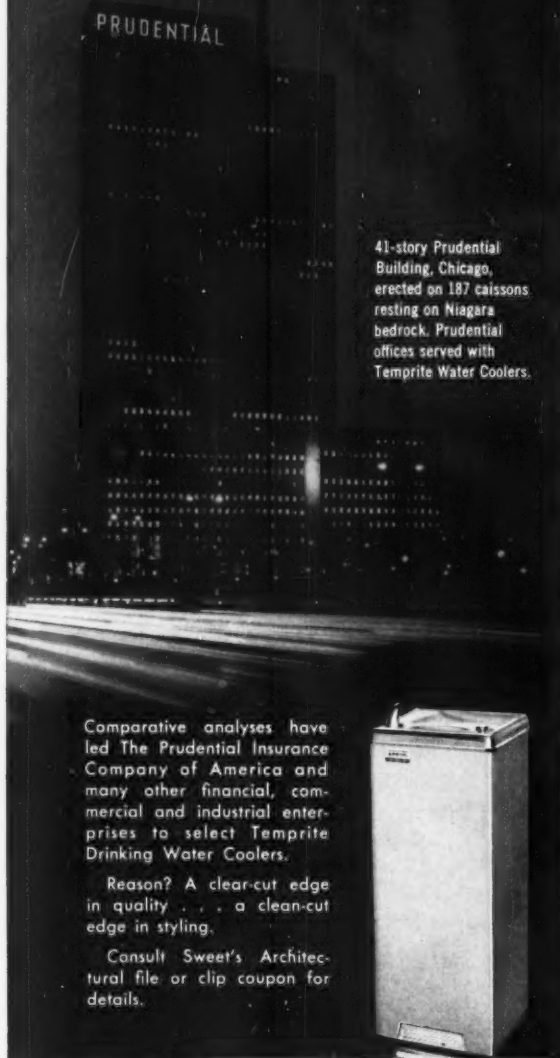
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Executives and is presently secretary-treasurer of the California Society of Association Executives.

CEAC Meeting Topics

In spite of an ailing arm, President Blume was released from the hospital to preside at the meeting. Blume reviewed some of the policy decisions laid down by the Board of Directors. More emphasis will be placed by CEAC on relations with city and county officials. An educational campaign will be undertaken to show how consulting engineers provide better engineering with greater economy to these governmental bodies. In addition, it was decided not to become involved in a local public relations program at this time, but to participate in any national program in which CEC may engage.

George Maurer, of Paquette and Maurer, reviewed and compared the studies on wages, salaries, and fringe benefits of engineering firms made by the southern and northern groups of CEAC. The meeting then was opened for general discussion. The question of attendance at conventions and compensation for expenses at these meetings was introduced. Some of the members said they encouraged key employees to attend, but did not pay expenses other than salary for time away from the job. Others paid all expenses. One firm financed the expenses of promising young key employees for advanced studies at engineering schools.

Another question involved the scheduling of vacations to cause the least disturbance to work programs. Most of the firms set up a system of priority in selection of the time for the vacation based on employee seniority. Every effort was made to set up a schedule which would prevent overlapping of vacation periods, taking too many employees away from their jobs at the same time. Another member had tried to have employees take vacations at times that would fall in periods of reduced activity. All admitted difficulty in handling this problem.

The problem of interviewing sales representatives of manufacturers was discussed. One member refused to allow any sales representatives in the drafting room. Others had the practice of interviewing only on certain days of the week. It was suggested that a central file be kept for all catalogs and engineering literature. If an employee decided to have copies of catalogs and other literature for convenient reference, a duplicate would have to be available in the central file or library. Instances were cited where an employee had left the company, taking along the only available copies of catalogs from the files. Such material should be considered company property.

The question of employee agreements also was considered. In many instances employees engaging

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For air conditioning systems, Armstrong Steam Humidifiers are installed to discharge steam directly into the plenum chamber or into ducts. Common methods of installation are shown in the accompanying drawings and photograph.

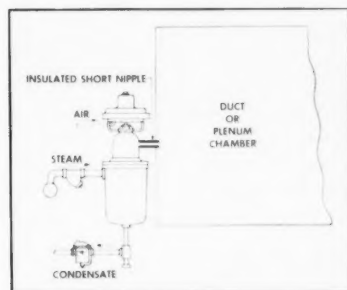


Fig. 1—Armstrong Humidifier discharging to duct or plenum through insulated nipple which should be as short as possible.

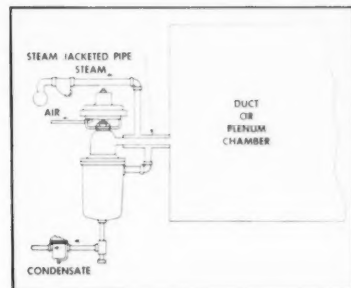


Fig. 2—Armstrong Humidifier discharging through short length of steam-jacketed pipe. Note steam supply to humidifier should enter top of jacket and leave at the bottom.

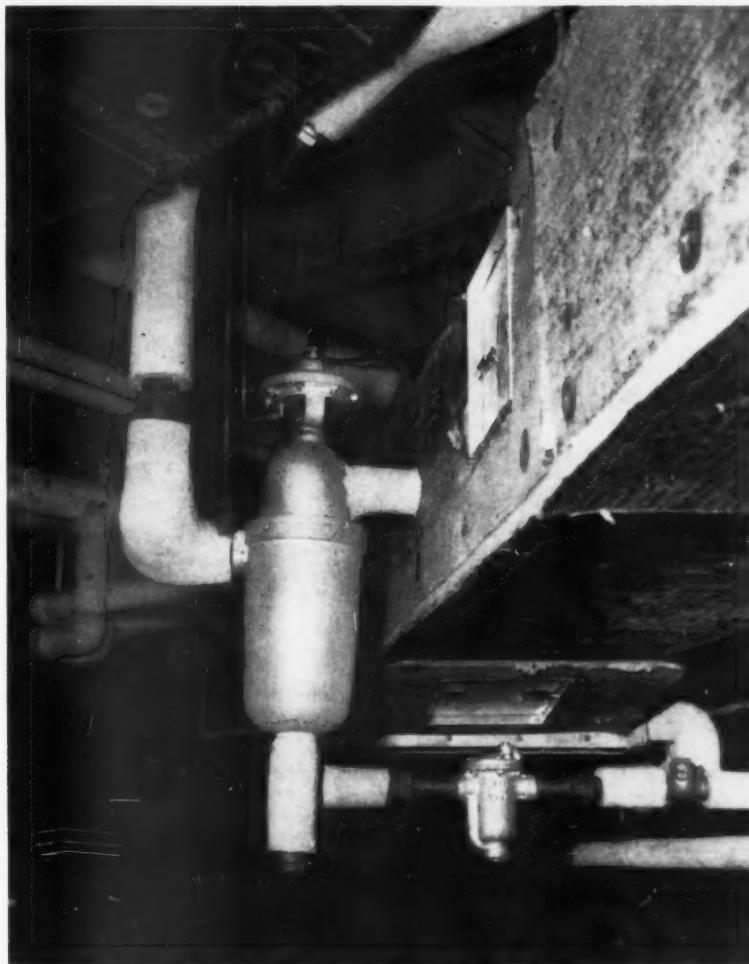


Fig. 3—Installation of an air modulating Armstrong Humidifier in the air conditioning system of a hospital.

The total installed cost of Armstrong Steam Humidifiers in air conditioning systems is surprisingly low. This results from the simplicity of the installation plus the fact the Armstrong price includes the integral air operator, strainer and steam trap, items that are customarily extra. The units are available with or without hygrostat.

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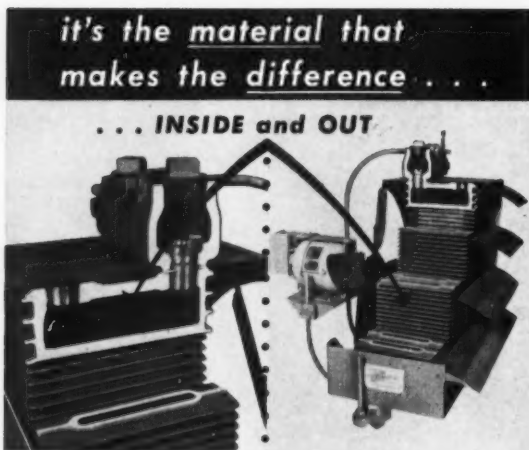
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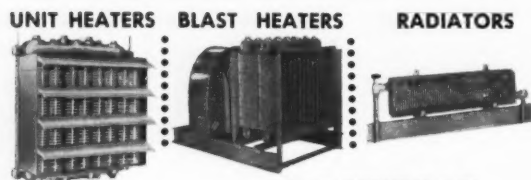
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in certain research and development studies for clients, at considerable expense to the firm, had considered ideas developed from these studies as their own personal property which they were free to use when they left the firm's employ. It was recommended that agreements be entered into with employees to insure that such developments be considered the property of the firm which employed them. It was pointed out that the legal departments of some clients insist on agreements with employees when they are engaged so that patentable processes and methods will be protected.

What should be considered the tools furnished by draftsmen and engineer employees was another subject for discussion. It generally was held that drawing instruments, triangles, and similar equipment be considered the property of the employee, and that drawing boards, T squares, and larger equipment, as well as expendable materials such as pencils, be furnished by the firm.

President Blume said that the association had under consideration a plan for members to give talks before engineering school classes on the function and place of the practicing consulting engineer in our economy. He asked for a showing of hands of those willing to address such classes, and a number volunteered to make such appearances.

Discussion on Seismic Design

The Structural Engineers Association of California held its annual convention at the Del Coronado Hotel, in Coronado, from Oct. 1 to Oct. 3. A progress report on a "Manual of Standard Practice in Seismic Design" was presented by John E. Rinne, structural engineer, San Francisco, and Herman Finch, structural engineer, Sacramento. A symposium on "New Developments in Seismic Design of Multistory Reinforced Concrete Buildings" included an outline of the Portland Cement Association program by Leo H. Corning, chief consulting structural engineer for the Association in Chicago; "Principles of Seismic Design in Reinforced Concrete," by Nathan M. Newmark, head of the Department of Civil Engineering, University of Illinois; and "Practical Aspects of Seismic Design in Reinforced Concrete," by John A. Blume, consulting structural engineer, San Francisco.

A panel discussion was held on "Design of Tall Buildings to Limit Drift" by three consulting structural engineers - Henry J. Degenkolb, San Francisco; Roy G. Johnston, Los Angeles; and James Ruderman, New York City.

Three papers were presented on structural steel design, testing, and construction. "Research in Structural Steel and Its Application to Structural Design," by Edward R. Estes, assistant director of research and engineering, AISC, New York; "Dy-



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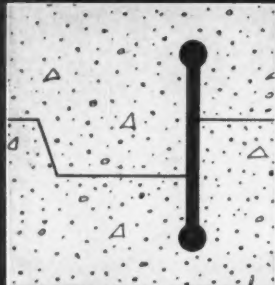
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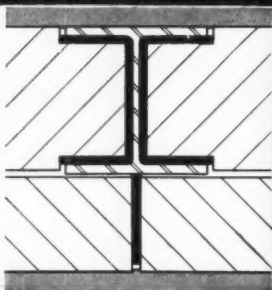
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dynamic Testing of Structural Members," by Jay R. Allgood, Structures Division, U.S. Naval Civil Engineering Research and Evaluation Laboratory, Port Hueneme, California; and "Folded Plate Design and Construction," by Milo S. Ketchum, consulting engineer, Denver. A demonstration was conducted by Walter Hyler on "Huckbolt" rivet fasteners with an outline of the research that led to their development.

A panel discussion on "Practical Lessons Learned Through Unusual Structural and Construction Problems" was led by Mark Falk, moderator, and James L. Stratta, structural engineers of San Francisco; and M. J. Heller, contractor of Sacramento.

A progress report was presented on the "Research Program Sponsored by the California State Division of Architecture" by J. F. Meeham, supervising structural engineer of the Division.

Building Design — An Engineer's Job

At a joint meeting of ASCE and the Structural Engineers Association of Southern California, Charles Luckman, of Charles Luckman Associates, Los Angeles, told about the work of both his firm as supervising architect and the work of Donald R. Warren Co. as consulting engineers, in planning the transformation of the 136-acre semishum area in Los Angeles. In his closing remarks, Luckman commented that when he graduated from architectural school, building designs were 75 percent architectural and 25 percent engineering, but now that he is practicing modern architecture he finds that 75 percent represents engineering and 25 percent architecture. It is the policy of Charles Luckman Associates, he said, to use the services of consulting engineers to the fullest extent.

Oregon Activities

Special membership classifications in CEOA are being considered by a committee consisting of Harry Czyzewski, chairman; Lee Caufield; Miles Cooper; and Harry Woelber. Recommended are three new classifications; senior member, for the consulting engineer who is nominally retired but is doing part-time consulting; life membership for the fully retired member of CEOA; and a two-year junior member grade for the young engineer who has just hung out his shingle.

The CEOA Health and Welfare Trust, placed in force July 1 by the trustees — Harry Woelber, Tom Miles, and Doran Huston — now has 20 firms and 270 people insured under the program.

Good progress also is reported on the public information program under the direction of a committee headed by J. Donald Kroeker, of J. Donald Kroeker and Associates, Portland. Two mailings have been made. The first consisted of "Framework



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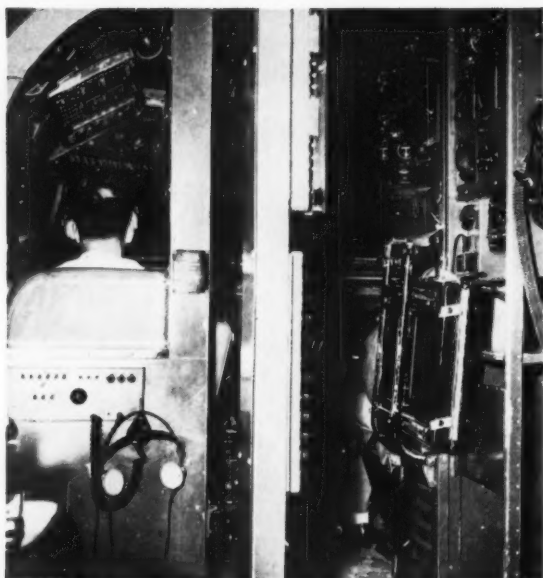
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of the Future," an attractive brochure describing consulting engineers and the profession, published by the Consulting Engineers Council, Springfield, Illinois, and the second a directory listing all individual CEAO members and firms. Mailing lists covered 1000 each of public officials; contractors; bankers; irrigation, sanitary, and water districts; and various other organizations, public and private.

Washington Referendum Fails

Milton B. Cook, secretary, Consulting Engineers Association of Washington state, reports that Referendum 31, which would have referred Senate Bill 127 to the voters for approval or disapproval, failed to receive sufficient signatures of registered voters by July 1. Senate Bill 127, passed at the last session of the Washington state legislature, will permit corporate practice of engineering. The principal objection to the bill was that the only requirement for the practice of engineering by a corporation is that a registered engineer be designated as being in charge of the practice of engineering. CEAW and the Professional Engineers Legislative Committee secured 49,000 signatures on the referendum petition, but a recount and invalidation of some signatures led to a decision by the Secretary of State that the petition lacked 1100 signatures of the 45,000 required.

Although Referendum 31 was defeated, Secretary Milton Cook expressed the view that it helped to strengthen the position of consulting engineers in the state and caused the various professional engineering groups to form a close alliance in a common cause. It is felt that in the next legislature there will be sufficient support to eliminate the objectionable features of Senate Bill 127.

CEAW has initiated the annual award of an honorary plaque to the outstanding consulting engineer in the State of Washington for service in strengthening and advancing the consulting engineering profession. At the September meeting of CEAW, the plaque was awarded to Horace J. Whitacre, of Tacoma, who led the fight to defeat Senate Bill 127.

Council Elects Officers

At a meeting held in Santa Barbara on September 19 and 20, the California Legislative Council of Professional Engineers elected the following officers for 1959-60. President, Philip W. Helsley, San Diego Testing Laboratories, Inc., representing ASCE; first vice president, Foster K. Sampson, electrical engineer, representing CEAC; second vice president, Robert W. Lundeen, representing AICChE, northern California section; and secretary-treasurer, Jack Long, civil engineer, representing San Francisco section, ASCE. ▲▲

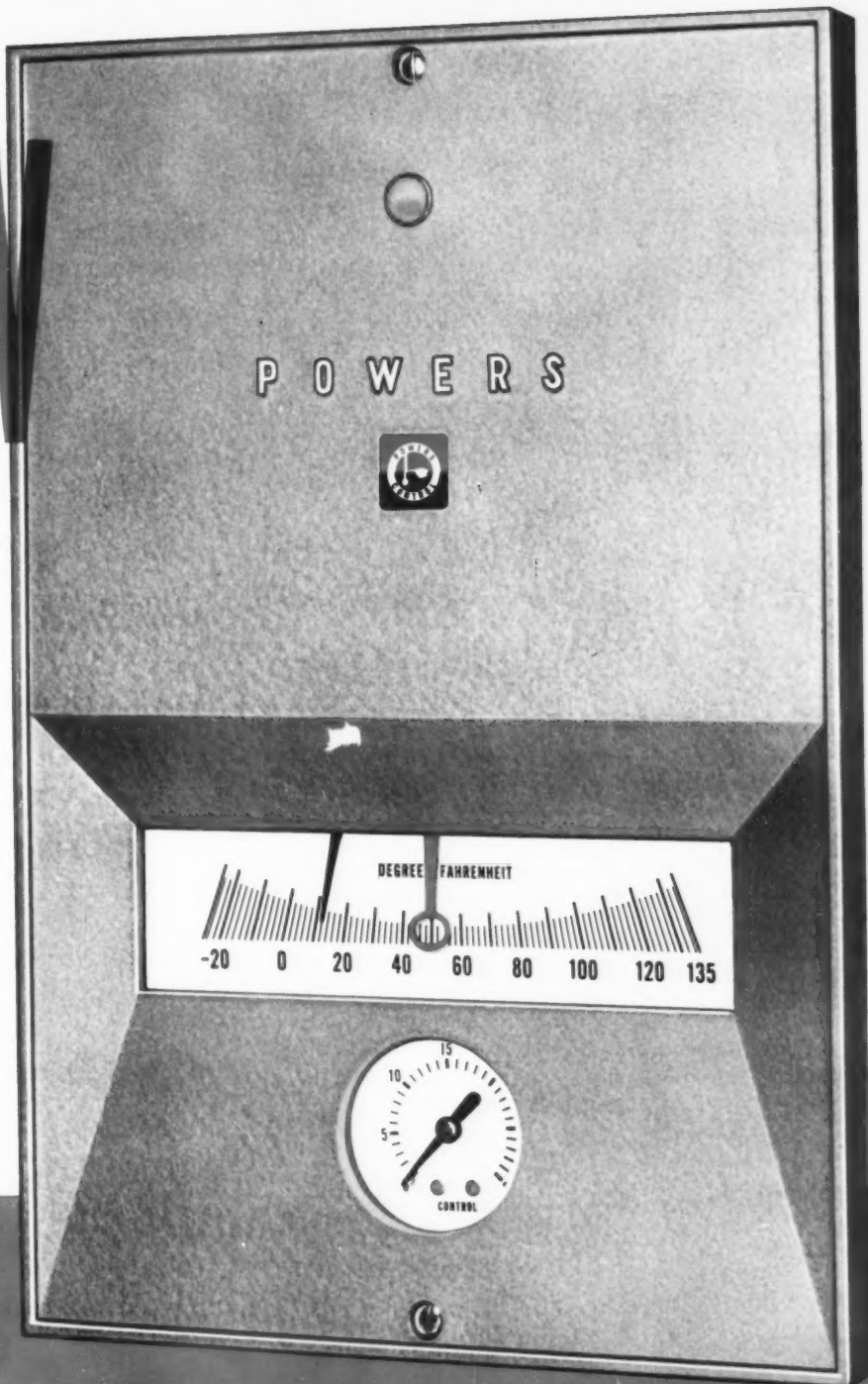
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*"Precise Control,
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Simple, Easy to Adjust,
Service or Maintain.
Reliable."*

*"Attractive
Modern Design
too!"*



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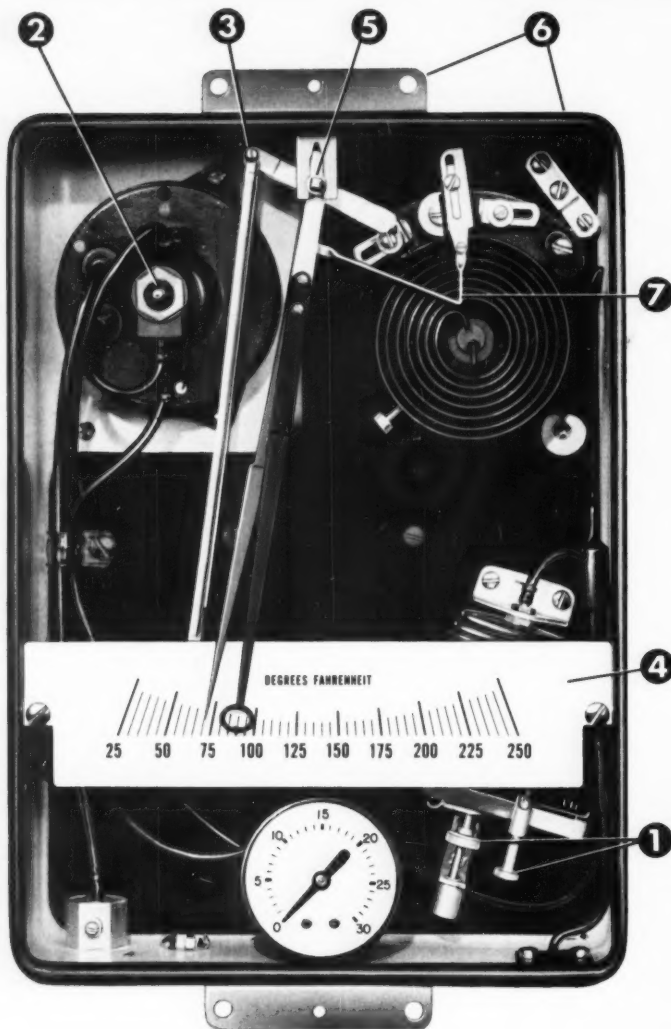
Series 200 Instruments

TEMPERATURE REGULATORS • SUBMASTER REGULATORS • PRESSURE REGULATORS
TRANSMITTERS & RECEIVER-CONTROLLERS • For Heating, Air Conditioning, Industrial Processes

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Check these POWERS QUALITY FEATURES

1. 0 to 35% adjustable throttling range and manual rest.
2. Ingenious new pilot valve design. Sapphire restriction and push button restriction cleaner. Cartridge filter for easy replacement. Non bleed design results in lowest air consumption.
3. Linkage design with captive screw principle. This prevents linkage connections from being jarred loose—yet permits easy reversing of linkages.
4. Large, easy-to-read-scale—a full 5½ inches.
5. Control point knob for concealed or external adjustment.
6. Universal mounting (flush or surface), bottom connections. Sturdy drawn metal case. Gasketed die cast cover has metallic gray enamel finish.
7. Automatic correction for change in ambient temperature around capillary and case.



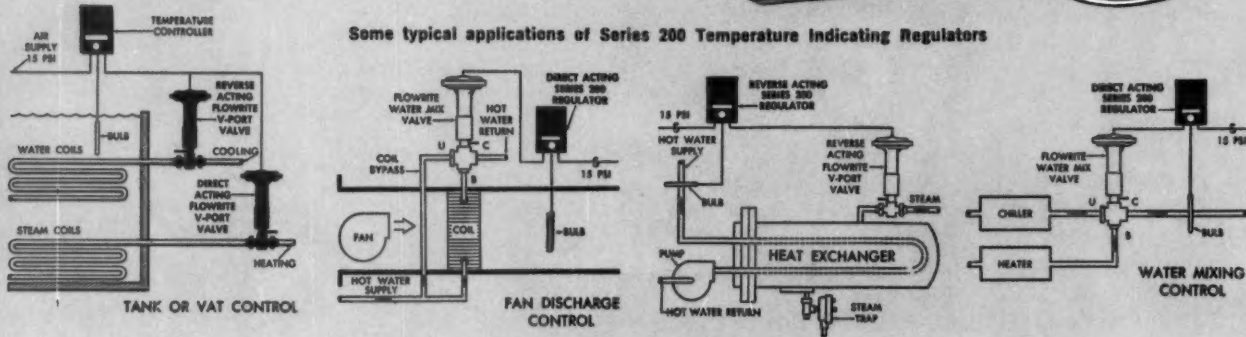
POWERS Series 200 Temperature Indicating Regulator

A pneumatic instrument designed for precise control of diaphragm valves, damper motors, Submaster Regulators and other devices used to control heating or air conditioning systems and processes. Various temperature ranges and bulb styles are available and described in Bulletin 370-1.

Cover Dimensions: 12¾" high x 8¾" wide x 3½" deep



Some typical applications of Series 200 Temperature Indicating Regulators



POWERS QUALITY CONTROL SYSTEMS—"Lowest in Annual Cost of Ownership"

Specify a POWERS CONTROL SYSTEM that will include SERIES 200 Instruments

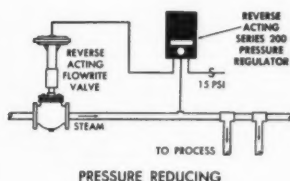
Compare their better control features that insure better performance.

They're easy to adjust, service and maintain.

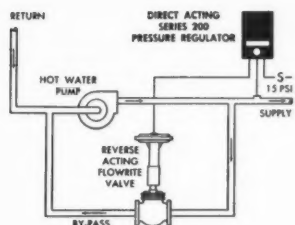
Note their modern styling and simplicity.



Pressure Regulator



PRESSURE REDUCING



PUMP — BY-PASS CONTROL

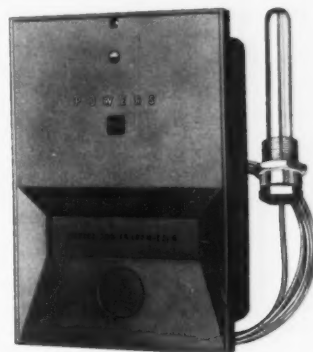
Powers Series 200 Pneumatic Control Instruments—meet the demand for precise control combined with a modern case design for mounting on centralized control panels. They were especially designed for applications in heating and air conditioning systems and industrial processes which require indicating regulators with the simplicity and time proven reliability of pneumatic control.

Series 200 Transmitter and Receiver-Controller combination provides the most accurate control obtainable where distances are too great for effective use of conventional thermal systems. The transmitter measures temperature in ducts, pipe lines or tanks and converts it into a 3 to 15 psi air pressure signal. This signal is transmitted to a remotely located pneumatic receiver-controller which indicates and maintains the temperature for which it was set, by regulating valves, dampers, sub-master regulators or other devices. Bulletin 371 gives further information about Powers transmission equipment.

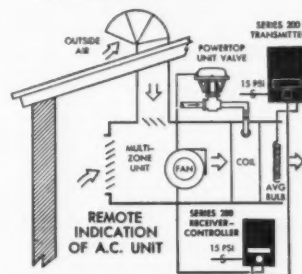
Series 200 Pressure Regulator—Wherever the precise indication and control of liquid, gas or vapor pressure is required this regulator is available in four standard ranges covering pressures between 30 inches (HG) vacuum to 350 psi. It has 0% to 35% adjustable sensitivity and manual reset. Bulletin 356 gives further information.

Series 200 Submaster Regulator—is a temperature indicating controller whose control point can be readjusted by a remotely located master control—a thermostat, hygrostat, pressure regulator or a manual positioning switch. See typical applications below. Bulletin 303-1 gives further information.

Call Your Nearest Powers Office for further information about these quick response, precision controls or write us direct.

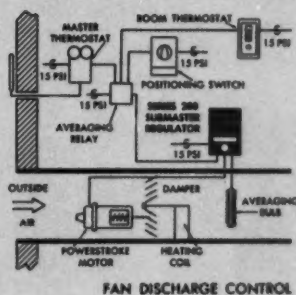


Temperature Transmitter



Series 200 Receiver-Controller

Some typical applications of



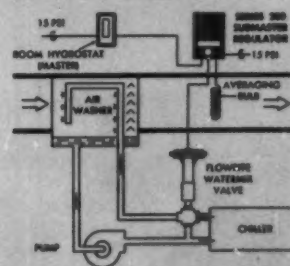
FAN DISCHARGE CONTROL



Series 200 Submaster Temperature Regulators

Temperature averaging bulb
Other types available.

Submaster Regulator



DEW POINT CONTROL

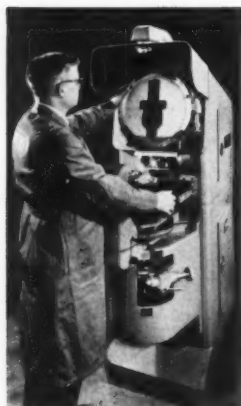
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They are ideally suited for control panels. Durable metallic gray enamel finish has a pleasing appearance and is easy to keep clean.



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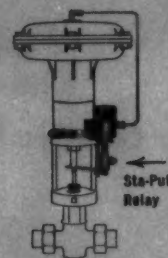
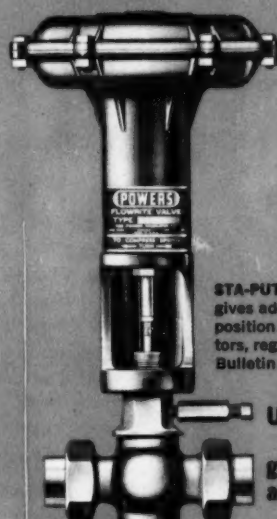
Optical Comparator at left is only one of the many aids used in controlling the high level of precision at Powers. The silhouette of a machined part may be enlarged over 50 times for critical inspection.



THE POWERS REGULATOR COMPANY • Skokie Ill. • Offices in 85 Cities

Powers FLOWRITE Valves

Compressed Air or Water Operated



STA-PUT RELAY valve positioner gives added power to accurately position valves or damper motors, regardless of load changes. Bulletin 358-1 describes it.

UNIQUE DESIGN FEATURES give close control and longer life

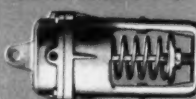
Characterized V-port Valve gives straight line flow thru-out valve travel. Renewable stainless steel poppet and separate shut off seat reduces wire drawing and insures tight shut off. Bulletin 344-V gives further information.



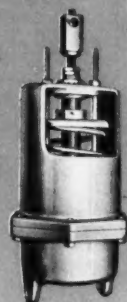
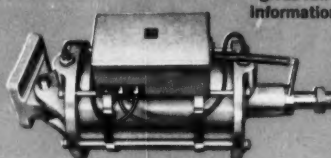
Powers Type 580 TEFLON Asbestos Packing, reduces maintenance, prolongs valve life—is used in all FLOWRITE Valves. Bulletins 344-S describes single seat valves, 344-DS Double seat Valves, 244-WM Water Mixing Valves.

Powers POWERSTROKE Piston Motors for pneumatically controlling various types and sizes of dampers and industrial operations.

Standard sizes 3"-4"-6"



Bulletin 343-1 gives full information



LC Piston Type Pneumatic Motor for heavy duty applications.

PRINTED IN U.S.A.

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WITH DETROIT STOKERS* FOR ECONOMY OVER THE YEARS!

Increasing numbers of forward looking engineers recognize that coal is the most economical fuel over the long term, and that it can be burned most efficiently with Detroit Stokers.

Stability of price and lower cost in most industrial areas have made coal the most favored fuel in new plants being built today.

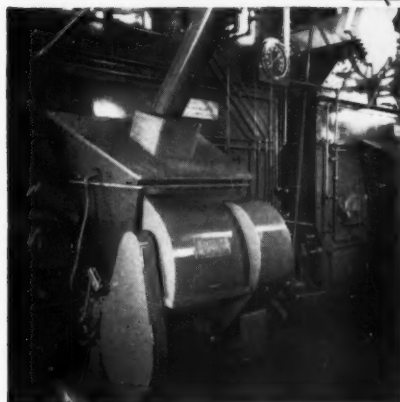
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YOU can enjoy the benefits of modern, economical coal firing—Let us show you the Detroit Stokers best suited to your operating conditions.

Detroit RotoGrate Stoker—for boilers up to 400,000 pounds steam per hour capacity. A spreader stoker with forward moving grates which continuously discharge ash at the front.



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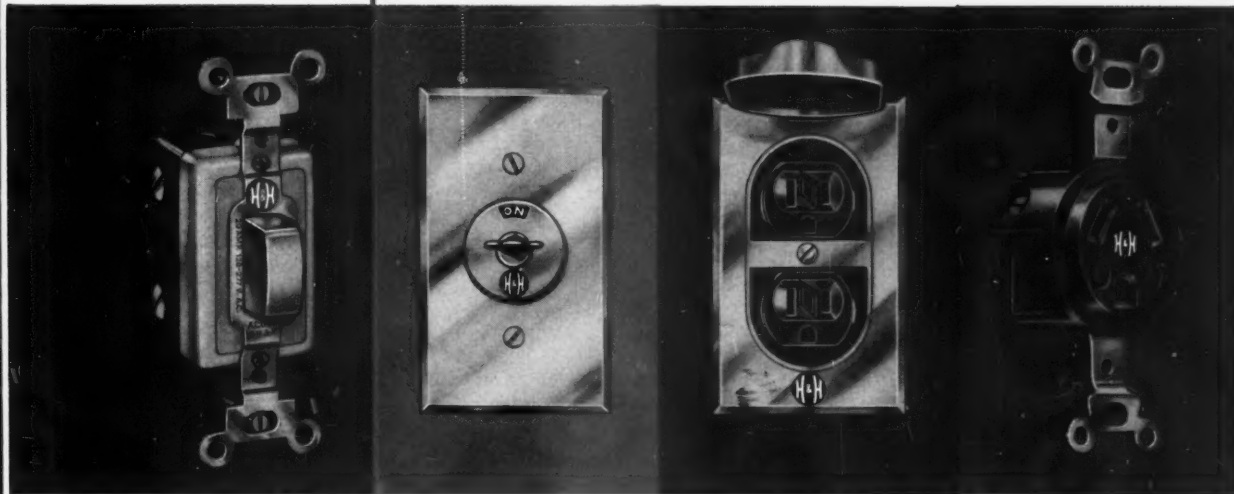
Detroit LeStoker—capacity range 3,000 to 12,000 pounds steam per hour. An underfeed stoker of high efficiency—available with "start and stop" or "full floating control."

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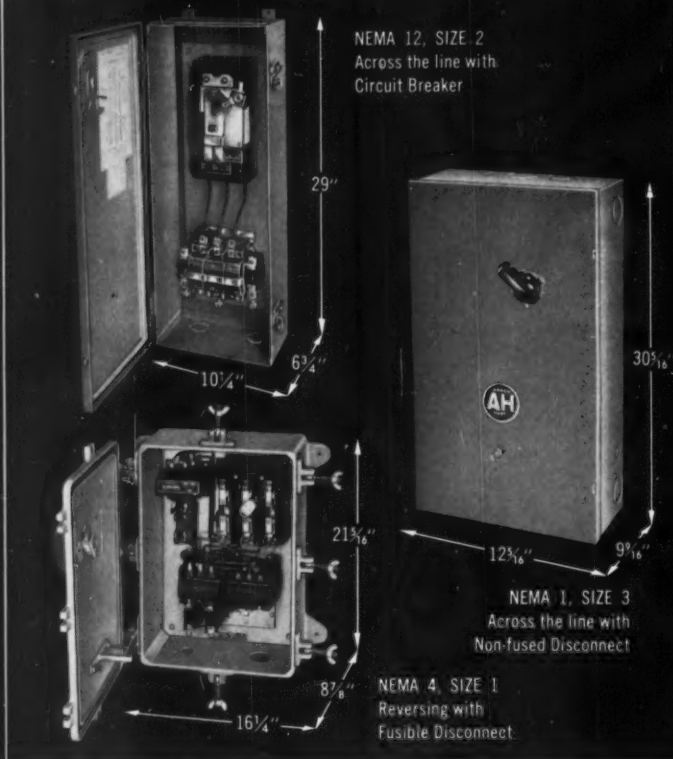
Write for the H&H Specification Index Chart—designed to simplify your specification problems to:
The Arrow-Hart & Hegeman Electric Company,
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20 amp., 277 V.

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Announcing: A COMPLETE LINE OF COMPACT, LIGHTWEIGHT COMBINATION STARTERS

Sizes 0, 1, 2, and New Sizes 3 and 4—and
NEW CAST ALUMINUM WEATHERPROOF
and EXPLOSIONPROOF ENCLOSURES

Starters are of exclusive "Right Angle" Design which brings important installation, maintenance and performance benefits. For convenience and safety, unit is front operated by means of Fused or Unfused Disconnect, or Circuit Breaker. Circuit Breakers are Instantaneous or Thermal Magnetic Trip Types. No other line offers enclosures that facilitate mounting and handling like the new cast aluminum NEMA 4 Weatherproof and NEMA 7 and 9 Explosionproof — Enclosures that are one-half the weight of old-style cast iron boxes. Other available enclosures: General Purpose (NEMA 1) and Industrial (NEMA 12 — oil-tight and dust resistant).

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Quality since 1890

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APPLIANCE SWITCHES • WIRING DEVICES

ARROW AH HART

consulting engineering firms to gather fee data on government projects. The findings of the questionnaire, "which was designed to get the fee facts," will be compiled as ammunition in the fight against criticism of the use of consultants in Federal programs.

Along with the questionnaire findings, NPSE plans to include a request that the Hoover Commission Task Force Report of 1955 on costs of government design engineering be updated.

Curricula Overhaul

The American Society of Civil Engineers and the American Society for Engineering Education, with the financial blessing of the National Science Foundation, are getting together about the future of civil engineering curricula.

Early this winter a conference will be held at Cooper Union's surveying camp, in Ringwood, N.J., to discuss what the modern civil engineer should be taught in college. Expected to attend the meeting are 20 to 30 engineering educators. No consultants have been invited.

In June, another meeting will be held. Harvard University and the Massachusetts Institute of Technology are cooperating in a special three-day session to discuss future sanitary engineering curricula on a graduate level. The American Sanitary Engineering Inter-Society Board is joining with ASCE and ASEE in this meeting.

Jersey Engineers and Architects

Several years ago, the New Jersey Society of Professional Engineers and the New Jersey Chapter of the American Institute of Architects prepared a joint Code of Ethics.

During the course of time and a number of printings on the part of both organizations, the wording of the Codes soon included a number of inadvertent discrepancies.

This summer, executive committees representing the engineers and the architects met together several times to see if these semantic dif-

CONSULTING ENGINEER

Here are
5 of the 18 reasons why
it pays to pick

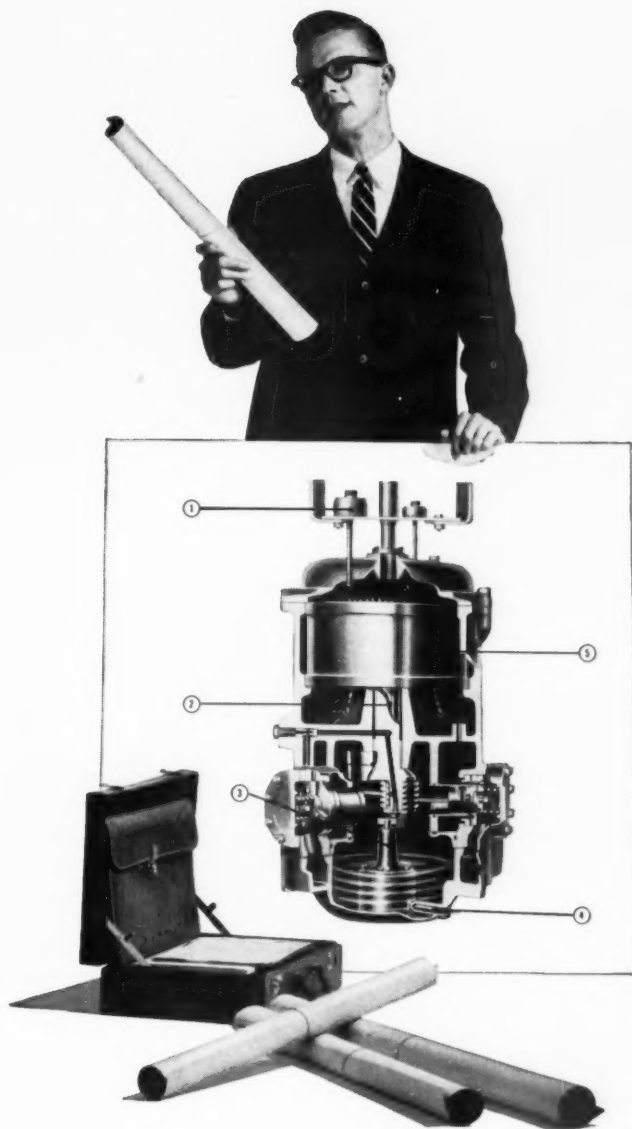
Climate by Chrysler



Cooling for comfort? Or cooling a process? Only Chrysler Airtemp SW Liquid Chillers offer so many exclusive engineering advantages. Take the hermetically-sealed radial compressor, for example. You get:

- ① *Floating power.* Rubber-in-sheer suspension absorbs vibration. Noise is gone . . . and so are vibration-caused service headaches.
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- ⑤ *Sealed-in motor.* Dust-proof for longer service life. Directly connected to dynamically balanced crankshaft to cut weight and operating costs.

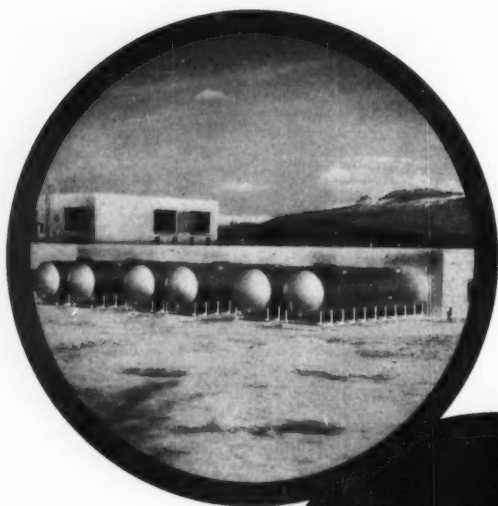
The rest of the 18 reasons? They include innerfin direct expansion chiller, automatic control panel, easier installation and . . . But why not get the complete story from your local Chrysler Applied Machinery and Systems sales office. Or write: Airtemp Division, Chrysler Corporation, Dept. X-119, Dayton 1, Ohio. In Canada: Therm-O-Rite Products, Ltd., Toronto, Ontario.



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GFC Multi-Cell Filters*

There's no time lost

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While one cell is being backwashed, the other cells provide: (a) Water for backwashing that cell **with or without** the use of storage tanks or surface reservoirs. (b) Uninterrupted filtering to maintain a continuous flow to service lines. Other important features include low-cost installation and GFC's patented non-clogging "Multi-Plate" underdrains. Write for bulletins and equipment data.

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AERATORS • FILTERS • SOFTENERS • CLARIFIERS
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ferences could be worked out. They decided it also would be a good idea to have a joint statement of policy outlining the duties of the architect and the engineer.

On Sept. 10 the architects agreed on a reworded Code of Ethics and a statement of policy. Since the engineers' meeting was scheduled for the next day, the Code and the policy were not adopted. The engineers felt they did not have time for a proper review of the policy statement. Some felt that the revised Code of Ethics was somewhat weaker than the original, and besides the suggested policies of the two groups did not coincide.

The New Jersey Engineers' definition of engineering (taken from the New York State Law) is:

"Professional services such as consultation, investigation, evaluation, planning, design, or responsible supervision of construction or operation, in connection with any public or private utilities, structures, buildings, machines, equipment, processes, works, or projects, wherein the safeguarding of life, health or property is concerned or involved, when such professional services require the application of engineering principles and data."

The architects' definition of engineering is:

"The engineer is particularly qualified by training, tradition and experience in the mathematical and physical sciences, particularly as they relate to structures, hydraulics, thermodynamics and electricity, and the coordination of their . . . specialties in connection with buildings and their environment.

"In addition to the services which the engineer renders to the architect as a specialized consultant, he also may engage as principal in those building projects whose primary purpose is to house and protect machinery and equipment."

The New Jersey engineers, who also took their definition of architecture from the New York State Law, failed to agree with the architects on a definition of architecture.

DIAMOND SHOT CLEANING

Its Advantages

This system offers much improved cleaning of certain areas of boilers such as tubular air heaters, horizontal superheaters, economizers, and reheaters. It will often accomplish effective cleaning where this has not been possible previously. Areas which tend to foul rapidly may be kept completely clean by increasing the length of the automatic shot cycle (it may be continuous if necessary) without disturbing boiler operation. No platforms or galleries are needed as with conventional cleaning equipment so aisle space often may be reduced.

Uniformly low draft loss and constant flue gas temperature are easily maintained because deposits are removed before they impair the thermal efficiency of the plant.

Cleaning is accomplished by thousands of steel shot that cascade over tube surfaces and ricochet from tube to tube, or through the insides of air heater tubes.



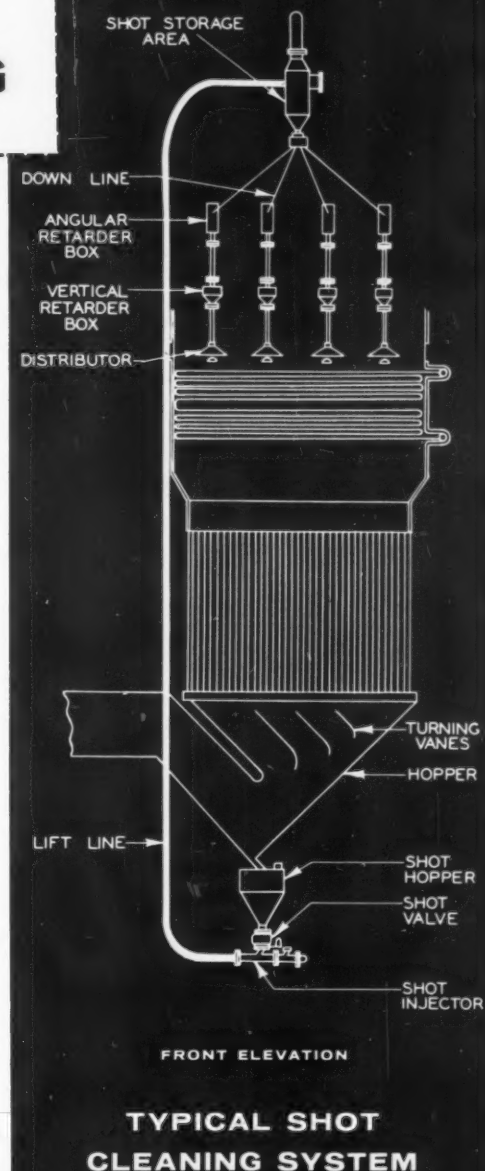
How It Works

Falling shot, spread uniformly by distributors scours the fouled area. Deposits are removed in small particles, most of which are carried away by the gas stream. Heavier particles fall into the shot hopper and recirculate with the shot until broken fine enough to pass out with the gases. Cleaning is thorough even with difficult fouling such as is found in black liquor fired boilers. The same quantity of shot will clean the entire vertical section with no limitations in height.

Operation is automatic. Shot is lifted pneumatically from the hopper to a shot storage area where it falls by gravity through retarder boxes to the distributors. Length and frequency of cleaning cycle are chosen according to the fouling rate of the area and the type of deposit.

More than 30 Diamond Shot Cleaning Systems are now in successful operation in the United States . . . some of them since 1954. This is the result of Diamond's extensive research in shot cleaning over a period of years. In Europe shot cleaning has been in use over ten years and there are more than 800 installations in highly satisfactory operation. To supplement our developments, Diamond has acquired U.S. rights to the Broman-Ekstrom System used in Europe.

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INFORMATION FOR YOU: Bulletins are available on Feedrail 60 Ampere Systems (90 Ampere Intermittent Service); 100 Ampere Systems (150 Ampere Intermittent Service); and Heavy Duty Systems of 225, 375 and 500 Amperes. Write FEEDRAIL, Department CE-11.



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So the architects and engineers still have semantic differences in their joint Code of Ethics—and no joint statement of policy.

Form Two Groups

Meanwhile, the Monmouth-Ocean (New Jersey) Society of Professional Engineers, at the fall meeting of NJSPE, has been divided into two separate chapters.

This is the small group which, one year ago, conducted an investigation of a railroad bridge across the Navesink River and complained on behalf of the public that the bridge was unsafe.

Recalling Monmouth-Ocean Chapter accomplishments during the past year, it was reported that less than one month after a story describing the bridge conditions appeared in *CONSULTING ENGINEER*, the railroad made all repairs the engineers said were needed.

Canadian Salaries

Architects in Canada recently were asked what they paid their employees. Median salary for engineers on their staffs is \$10,200, with a range of \$6000 to \$15,400. Registered architects on the staffs had a similar median salary, but a wider range — from \$4200 to \$18,500.

Consultants Advertise

As a part of its public relations program, the Association of Consulting Engineers of Canada took a late summer ad in the *Financial Post* and is planning to publish a second advertisement before the end of the year.

The first ad, which included a list of Association members, stated: "The Association of Consulting Engineers of Canada is an organization of leading consultants who are engaged solely in consulting professional engineering, recognized for their experience and technical competency and practicing professional engineering in Canada and abroad in accordance with ethical standards and practical efficiency in their respective fields of spe-



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But also this!

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- 3 Each local distributor is staffed with skilled, factory-trained technicians. They also have complete stocks of standard replacement parts. Continuous, uninterrupted performance of every Executone system is assured.



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Engineers and architects are invited to send for Executone's 325 page Reference Manual "F-9." No charge or obligation. Please use your letterhead.

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cialization. Its membership includes principals of over 60 firms of consulting engineers located in all parts of Canada and employing over 2000 professional engineers, technicians, and office assistants."

Through application of good typography, the ad had the proper professional appearance.

Delaware Association?

A preliminary meeting has been held to discuss the possibilities of forming a Delaware association of consulting engineers. Another meeting is to be called shortly to discuss organizational problems.

At the meeting, attended by former Consulting Engineers Council President John K. M. Pryke, Daniel Koffler, of New Castle, outlined some of the reasons an organization for engineers in private practice is needed in Delaware.

The architects are strong, making their voice heard on legislative matters and managing to get the State to agree to a 6 percent fee for schools. Yet the use of a consulting engineer is not required on Delaware schools, and to date the voice of the engineer has been that of an employee.

Delaware consulting engineers also face "free engineering," with county and industrial employees doing engineering on the side for a very small fee. There is also a lack of public understanding as to the role of the consultant.

Pointing out that Delaware is a small state with a relatively small number of consulting engineers, Koeffler stated that, "If only the eight firms represented here banded together, at least someone would be speaking for the engineer in private practice."

Complaint System

In the future, when complaints about Kansas consulting engineers are made by divisions of the State Highway Department, the consultants will know about it.

In a meeting with the secretary-manager of the Consulting Engi-



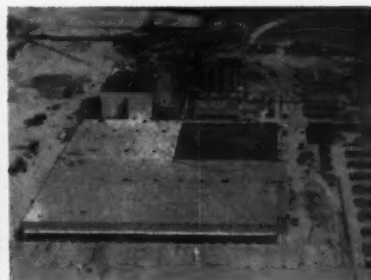
The Schlitz "headquarters" brewery at Milwaukee uses 4 pulverized coal-fired C-E boilers, Type VU, each with a capacity of 60,000 lb. per hr.



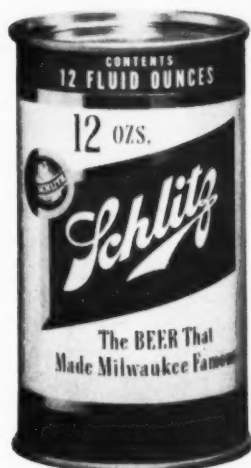
Two oil-fired C-E boilers, Type VU-10, supply 60,000 lb. of steam per hr. for process purposes at the Schlitz brewery in Brooklyn, N. Y.



This 20-million dollar showplace is the Schlitz brewery in Los Angeles, California, which uses 3 C-E boilers, Type VU-10. Fired with natural gas and oil, they generate 90,000 lb. of steam per hr.



At its Tampa, Florida, brewery, Schlitz uses 2 semi-outdoor C-E Package boilers, Type VP. They provide 72,000 lb. of steam per hr.



"The Beer That Made Milwaukee Famous" . . .

is brewed with **C-E STEAM**

Eleven C-E boiler units, ranging from the semi-outdoor, oil-fired package type to the pulverized coal-fired, vertical unit type, provide the steam to make "The Beer That Made Milwaukee Famous."

Since 1946, when the Jos. Schlitz Brewing Company purchased four C-E boilers as part of an expansion and modernization program at Milwaukee, the Company has purchased C-E units for its breweries in Brooklyn, N. Y., Los Angeles, Calif., and Tampa, Fla.

Due to the nature of brewing and bottling operations, load swings are

wide and rapid, and boiler response must be both unfailing and prompt. How well C-E boilers have met this challenge is evidenced by the repeat order record—a record made even more impressive by the fact that the Jos. Schlitz Brewing Company has obtained consistently high performance with not just one type of C-E boiler—but with three.

When you need a reliable and efficient source of steam—remember that the Schlitz slogan "Move Up to Quality" applies to boilers as well as beer.

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Complete systems for laboratory and process stream analysis — control.
CHROMA-CAT series extends utility of analysis, allows use of Air as carrier gas.

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neers' Section of the Kansas Engineering Society, Chief Engineer Walter Johnson agreed to instruct Highway Department division personnel to make any complaints they think they have against consulting engineers in writing. A copy then will be provided to the KES office, which can let the engineer know what is going on.

Bill Defeated

In Wisconsin, a bill was introduced to impose a special examination on registered professional engineers before they would be allowed to design buildings. Termed "dual registration," the bill was understandably unpopular among engineers. The American Society of Civil Engineers volunteered its support in defeating the proposal, which was introduced at the request of the Wisconsin Chapter of the American Institute of Architects. The bill was defeated.

Certified Registration

Between now and next February, all levels of the New York State Society of Professional Engineers will be investigating the advisability and the methods of procedure for "certified registration."

The proposed certified registration resembles the "integration" which has been discussed off and on — always unofficially — in National Society of Professional Engineers circles. Under certified registration, it would be required that before a licensed engineer can become registered he must show that he is a member in good standing of the NYSSPE. As Charles Wurmfeld pointed out in his report to the executive committee, the aim of certified registration would be better policing of ethics in the engineering profession.

Integration differs from certified registration in that integration proposals also suggested that NSPE take over the licensing examination and the granting of licenses. Under certified registration, this still would be entirely in the hands

of the State Education Committee.

Some time ago, a program similar to certified registration was discussed in Missouri with no resulting legislation being enacted. Wurmfeld explained that this was mere coincidence, with two separate groups finding similar solutions for the same problem. NPSE spokesmen said the national organization never has received a request to discuss certified registration, and thus NSPE has no official opinion on the matter.

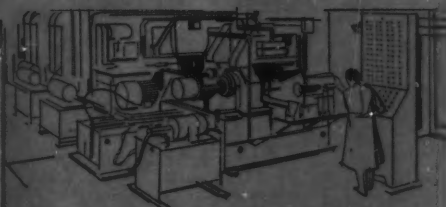
Several years ago, a Joint Professional Committee for Study of the Educational Law was appointed in New York State with the primary purpose of coming to some decision on corporate practice. During their discussions, the Joint Committee agreed that a better method of policing ethics among engineers was needed in New York State.

Wurmfeld's report said, "There are two existing methods of enforcement in New York State. One lies through the State Department of Education, which maintains a staff of investigators under the Executive Secretary. These investigators number approximately 16 men and are used for all the professions under the Department's jurisdiction. They are not professional engineers and their operations are limited.

"The other method of enforcement in New York State relies ultimately upon injunctive court proceedings brought by the Attorney General. The Attorney General will prosecute any case which has been sufficiently documented by the Society (or any citizen for that matter). He will not act, however, as an investigating agency on mere suspicion or even on an actual complaint which has not developed adequate evidence. The Society, of course, does not have any powers of subpoena or any other means of investigating. Our Ethics and Practice Committee is reduced to dealing with unlicensed violators who have produced prima facie

AUTOMATION BEGINS HERE

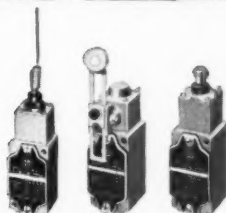
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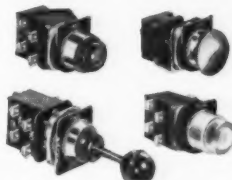
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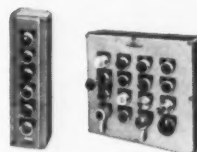
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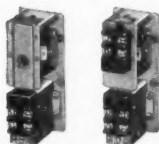
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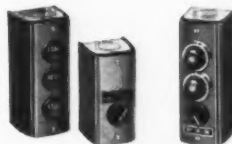
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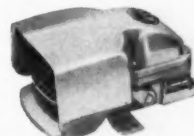
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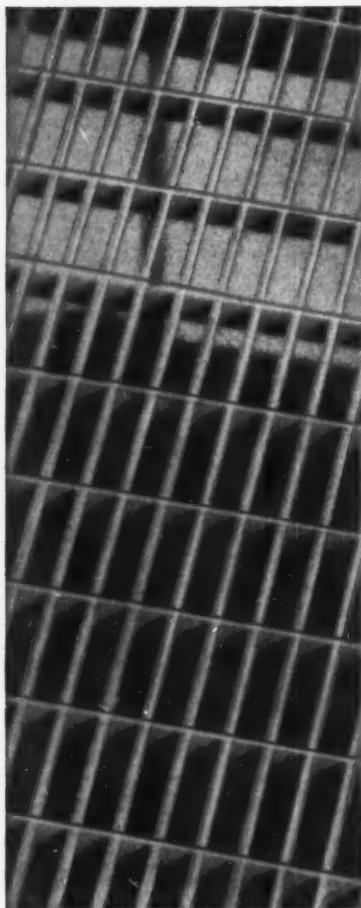
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NOVEMBER 1959

91



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evidence against themselves by public advertising (telephone listings, etc.). The entire practice of engineering licensed under the police powers of the State is being carried on without any adequate machinery for policing. The only reason the public and the legislature permit this condition is that they are under the complete illusion that engineering practice is controlled by the profession just as other professions control their practice; an illusion which the Society has wrongfully fostered by its tacit concurrence.

"Under the Canadian method the 'Association of Professional Engineers' is in itself an arm of the Provincial Government. The Association has the sole authority to prescribe qualifications, give examinations, and register qualified persons to practice. It is directed by law to set up its own code of practice and the complete machinery of enforcement through a council elected by qualified practitioners. Enforcement of ethics is thus completed within the control of the profession."

Wurmfeld added that, "The licensing procedures in this State are a model for the entire country, and there is no thought of changing these procedures. It is only in the matter of continuing control after the initial licensing that some change is required."

Of course, certified registration also would be one of the most comprehensive and effective membership drives ever conducted by a U. S. engineering organization.

Certified registration is scheduled for discussion at the NYSSPE February meeting in Albany. Prior to that time, certified registration is to be discussed on a chapter level, the legislation committee is to compile a suggested amendment to the law making certification possible, the registration committee is to go over the matter thoroughly with officials of the State Education Department, and the constitution committee is to study the changes

that would be necessary in the constitution and bylaws.

Other Action At Niagara Falls

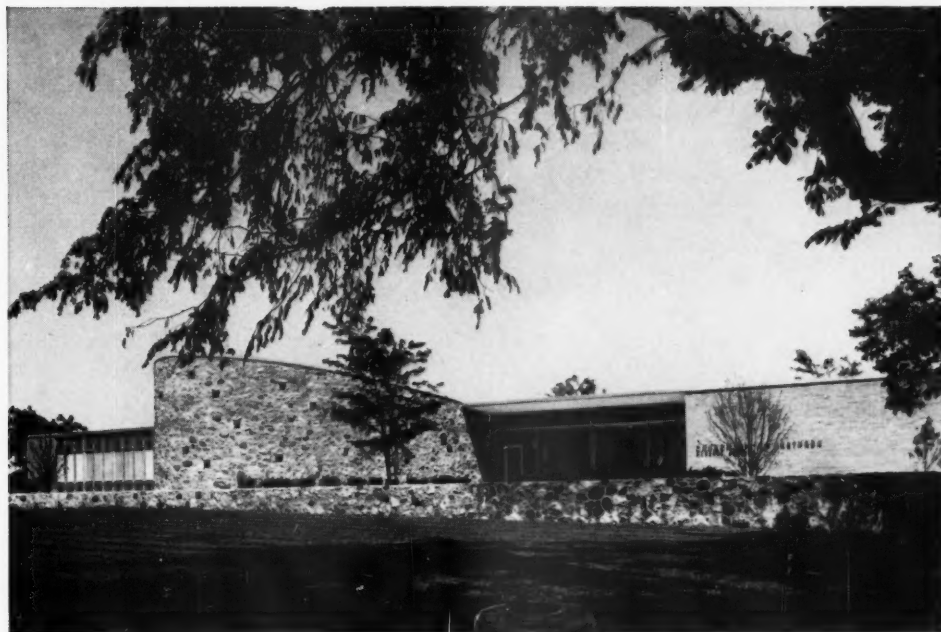
Past President Leigh St. John said he has written to the major professional societies in New York State proposing the formation of a Professional Joint Council. He already has received a "warm response" from the president of the New York State Bar Association. Aim of such a committee would be to have a law passed preventing municipalities from passing local laws or issuing executive orders preventing professional societies from representing their members on matters relating to salary and professional status.

The Public Service Functional Section reported the first round lost, when the Commissioner of the New York City Department of Labor issued a certificate giving exclusive bargaining rights to the AFL-CIO in the specialties of "engineering" and "railroad." Of course, this is only one group of 20 men among the many city employees. The Commissioner told NYSSPE that he "is not conceding the sufficiency of the Society's interest in the proceeding." This was after 15 of the 20 men authorized a Union dues check-off, and only three joined the Functional Section.

The Statewide Employment Committee is operating as a committee of NYSSPE, making no charge to members for its services. A suggested amendment to the New York State law is to be presented at the February meeting, asking that professional engineers be granted official permission to operate an employment agency among its membership. At present, the law grants this permission to attorneys, physicians, nurses, and other professional groups.

Location of the NPSSPE office is to remain in New York City. The vote decision was based on very little discussion.

An executive director will not be appointed, as a motion that the



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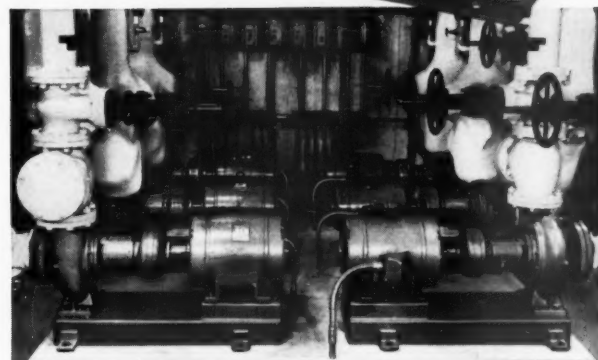


PUBLISHING HOUSE COOLED QUIETLY WITH B & G PUMPS

The Church of the Brethren at Elgin, Illinois, publishes numerous religious papers. In the office and factory of this organization, the 300 ton cooling load of the two buildings is handled with chilled water, circulated by four B&G Universal Pumps. Two additional Universals are used as condenser water pumps.

Universal Pump motors are specially constructed and selected for *extra quiet* operation. Long sleeve bearings are used in both motor and pump—another assurance of smooth vibrationless operation and long life. The oversized shaft is made of special alloy steel with an integral heat-treated thrust collar to absorb end-thrust. Water leakage is prevented by the diamond-hard "Remite" Mechanical Seal—a B&G development.

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One PD35 Booster is used to circulate hot water for heating and cold water for cooling in building connecting plant and office; one 2" Booster circulates boiler water through fuel oil preheater.

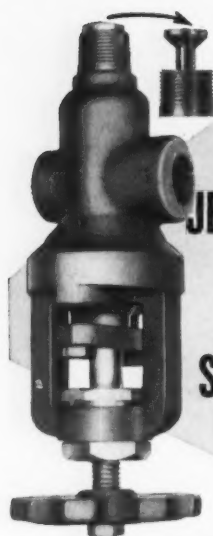


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**Completely self-draining
valve features freeze-proof
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The newly improved design of the Jerguson No. 23 Drain or Sampling Valve uses a special-type bolted bonnet which assures perfect alignment and freeze-proof action.

Self-Draining: Valve stem seats on outside of valve body inlet; no liquid remains in nipple or valve.

New OS&Y Construction: Built for corrosive conditions where inside threads cannot be tolerated. Simplified Outside Screw and Yoke Bolted Bonnet... forged yoke supports stem away from valve body; separate forged gland-follower bears directly on packing, entirely independent of yoke.

Perfect Alignment; No Freezing: Design assures perfect alignment of valve, and prevents freezing by allowing stem to work freely at all times. Operates in normal direction with left-hand thread on stem.

Sizes; Pressures: Popular $\frac{3}{4}$ " x $\frac{3}{4}$ " size for 4000 lbs. @ 100° F. is standard with $\frac{1}{2}$ " plugged "steaming out" or purge connection. Other sizes: 1 x 1", $1\frac{1}{2}$ x $1\frac{1}{2}$ ", 2 x 2". Many optional features.

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1960 budget include provisions for an executive director was tabled.

Land surveyors who are not registered engineers cannot be members, was the advice NYSSPE received in a reconfirmation of NSPE policy.

Ground Broken

The engineering societies made a good start on the new headquarters building with the dean of the consulting engineering profession—Herbert Hoover—selected to break ground for the 18-story structure across from the United Nations.

Assisting Mr. Hoover with the honors was Jerry Fujimoto, representing the engineers of the future. Fujimoto, 18, was described as a member of the newest engineering class in the oldest engineering college in the U. S. (Rensselaer Polytechnic Institute) and from the newest state (Hawaii).

The fund drive for headquarters is going well, with more than \$7 million collected to date. The American Institute of Chemical Engineers was the first society to reach its quota. The \$7 million does not include the contributions of one engineer, who sent his donation in green stamps.

ASA To Move

The American Standards Association plans to move to new quarters by the first of the year. The Association offices currently are in New York City's Grand Central Office Building, which is scheduled for demolition next year. The new offices, which will allow the consolidation of services through expanded quarters, will be at 10 East 40th Street.

Office Trends

The National Office Management Association, in a compilation of surveys on employment conditions made from 1951 to date, reports:

Union Contract Coverage—Proportion of clerical workers whose salary rates and working conditions are covered by collective bargain-

ing agreements is less than 10 percent. This percentage has been fairly stable during the 1950s.

Scheduled Work Week—While a scheduled work week of 40 hours has prevailed among about 70 percent of the companies surveyed since 1951, indications are that the work week is becoming shorter for some clerical workers.

Overtime—Extra time usually is compensated at premium rates, but there are exceptions. An increasing percentage of the companies surveyed are paying clerical workers overtime after eight hours in a day. The reverse of this trend seems to apply in the case of weekly overtime, where fewer are paying premium rates for hours in excess of 40 in a week.

Holidays—Six paid holidays per year continues to be the most prevalent practice, but this trend has been losing ground rapidly. More companies are granting seven and eight holidays.


Life and Health Insurance Benefits—The number of companies that are providing life insurance and hospital and surgical benefits is increasing. But since a high percentage of companies were providing this coverage as early as 1951, this trend is not extreme. However, a marked change has taken place in who pays the premiums for the benefits. An increasing number of companies are picking up the tab for life and health insurance.

Retirement Benefits—Prevalence of retirement benefits has increased almost 50 percent.

Extra Compensations—The trend is away from payment of bonuses.

Now International

The U. S. National Committee for the International Society of Soil Mechanics and Foundations Engineering has taken over duties formerly carried out by the U. S. National Council on Soil Mechanics and Foundation Engineering. The Fifth International Soils Conference has been scheduled for Paris in 1961. ▲▲



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Pneumatic Round**



New examples of Honeywell's leadership in pneumatic controls—all perfectly matched for top performance



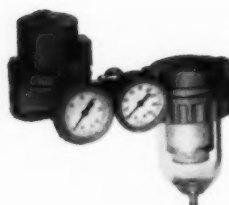
New Small Valves (VO520A and C; VO521A) For individual room temperature control. Newly designed, both valves incorporate a new rolling-type diaphragm actuator which greatly increases capacity and close-off ratings, in a compact size. VO521A (illustrated) is available in normally open, straight-through or angle patterns. For both steam and hot water applications.



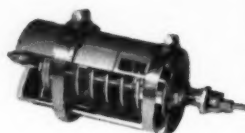
New Automatic Air Dryer (WO25A2) For an improved primary source of dry control air. Only Honeywell offers a twin-bed dryer with automatic time programming for regeneration of the beds. Provides a reliable source of dry air, yet requires very little maintenance—an ideal solution to the problem of extracting moisture from compressed air supplied to the control system.



New Electronic-Pneumatic Relay (R07903 A and B) For precise control of conditioned air or water sources. Fully transistorized, the R07903 employs electronic sensing, pneumatic positioning—combines the sensitivity of electronic thermostats with pneumatic operators. Designed for summer or winter applications, with provision for both discharge and outdoor compensation.



New Pressure Reducing Valves and Filter Station (PO902 A and B) For better primary source of clean control air at the proper pressure. Advanced engineering and new design result in a fully integrated two-unit system—filter with transparent housing and replaceable filter element, and pressure reducing valve with built-in safety pressure relief valve. Plastic housing signals need for filter change by coloring when dirty.



New Piston Motors (MO903 A and B; MO904 A and B) For exact damper positioning. Brand-new pneumatic power unit for positioning dampers. Has rolling-diaphragm operation for high force output, long life. Universal mounting bracket permits external or internal installation on all makes of dampers.

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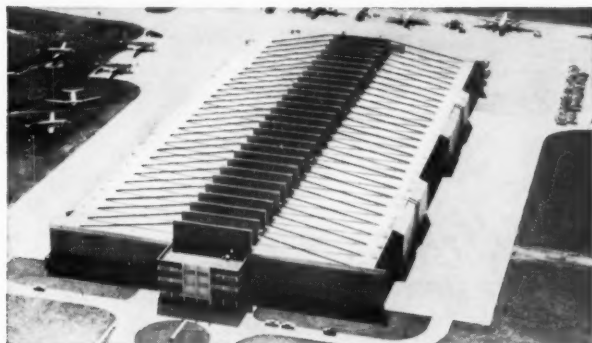
For further information, call your nearest Honeywell office. Or write: Minneapolis-Honeywell, Department PC, Minneapolis 8, Minnesota.

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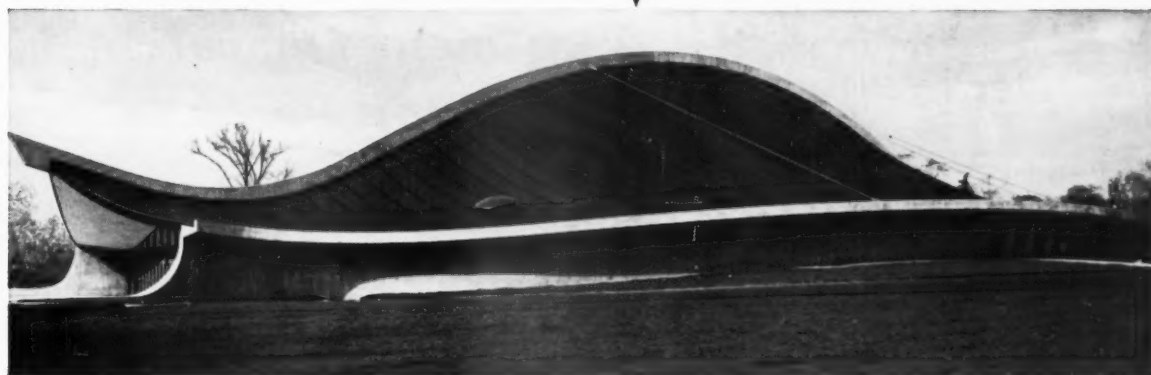
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UTICA MEMORIAL AUDITORIUM, N. Y. Architects: Gehron & Seltzer, New York City • Associate Architect: Frank C. Delle Cese, Utica • Consulting Engineer: Dr. Lev Zetlin, New York City • Contractor: Sovereign Construction Company, Ltd., Fort Lee, N. J. • Roof Supporting Structure, Including Cables, Furnished and Erected by Roebling



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Shown here are a few of the examples of what architects and builders are doing with the suspended roof. We at Roebling seriously invite your inquiries on *any* phase of the suspended roof or other types of suspension systems. Our history includes suspension bridges of every description, tramways, guyed towers and ski lifts. Any means of communication to John A. Roebling's Sons, Bridge Division, Trenton 2, New Jersey, will bring you a wealth of material.

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Floating Seats Give Perfect Seal. Each seat in W-K-M's *Pressure Sealing Gate Valve* consists of two kinds of rubber, formulated to W-K-M's specifications, molded to a hardened steel insert. There is a full bore opening, the same diameter as the port, through the insert.

Soft rubber, for sealing, is on the back side of each seat. Tougher, abrasive-resistant rubber is on the front or gate side. The steel insert is ringed with holes. Pressure forces the soft rubber through these holes, reinforcing the tough rubber and compensating for any wear.

Line Pressure Seals the Seats. In the closed position, the gate forms a primary seal with the raised ring of tough, firm rubber on the face of each seat. As the line pressure is applied to the valve, the gate is forced against the rubber ring on the downstream seat and compresses it until the gate rests against the hardened steel insert. This provides a tight seal between the gate and the rubber on the face of the seat, and a secondary metal-to-metal seal. The action also forces the soft rubber on the back of the seat tightly into its recess and prevents any downstream flow at this point. The result: a bubble-tight downstream seal.

The upstream seal is caused by line pressure forcing its way into the seat recess behind the upstream seat, moving it against the gate. This pressure is sufficient to achieve a positive seal between the gate and

the ring of tough rubber on the face of the seat. At the same time, the raised rim of soft rubber on the back of the seat forms a tight seal with the seat recess.

These double-action floating seats provide tight, positive seals — both upstream and downstream.

Change Seats in Minutes — On the Line! You can change the seats in W-K-M's *Pressure Sealing Gate Valve on the line*. The only tools needed are a wrench to loosen the body bolts, and a pair of pliers.

Important Safety Feature: This valve has been designed to automatically relieve excessive body pressure caused by thermal expansion. The excess pressure forces the upstream seat away from the gate, allowing it to bleed into the line.

Additional Advantages: The full bore, through-conduit gate construction provides a perfectly smooth bore through the valve, eliminating pockets or cavities in which foreign matter might accumulate. Result: perfectly smooth flow with no more turbulence or pressure drop than through an equal length of pipe.

W-K-M's *Pressure Sealing Gate Valve* is a two-way valve and may be installed with the pressure on either side. It is especially well suited for block and bleed service since it seals positively both upstream and downstream. The body may be bled of pressure with the gate in either the fully open or fully closed position.

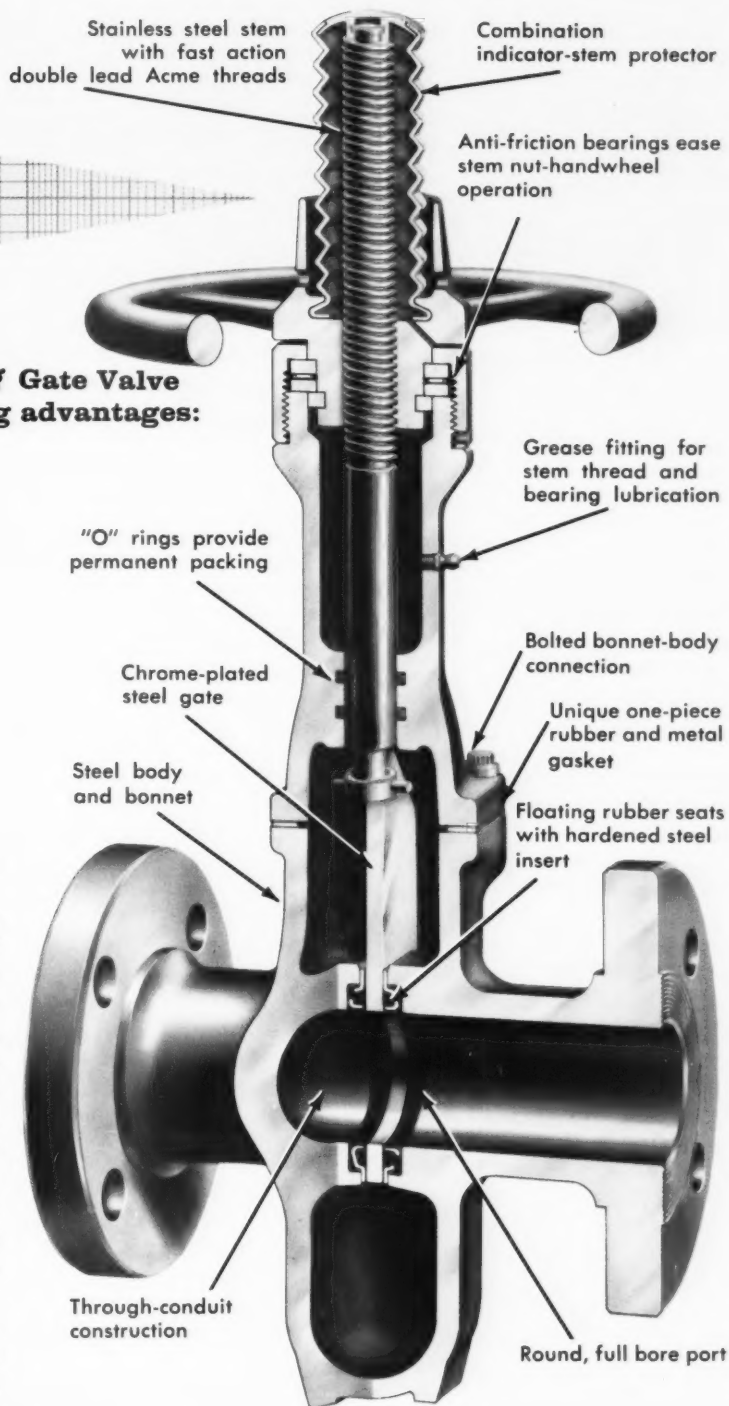
ANOTHER OUTSTANDING PRODUCT OF W-K-M's *Creative Engineering*

W-K-M's *Pressure Sealing Gate Valve* gives you all these operating advantages:

- Tight seal both up and downstream in open and closed position
- Full bore, through-conduit
- Seats fully protected from abrasive action of lading
- Non-lubricated
- Seats automatically adjust for wear
- Automatic relief of excessive body pressure
- Ideal for abrasive ladings, light gases, volatile liquids up to 250° F.
- Easy to overhaul on the line

Tested and Proved in the Toughest Services. Enthusiastic, completely favorable user reports affirm the superior quality and effortless operation of W-K-M's new *Pressure Sealing Gate Valve*. "Handles all the sludge in a gas blowout line easily — works better than any valve we've used," states a petroleum engineer. A foreman says, "... easiest operating valve I ever saw ... smoothest working valve made." Similar reports covering many other services are in W-K-M's engineering test data files.

One of the Most Versatile Valves Ever Produced. W-K-M's *Pressure Sealing Gate Valve* is extremely versatile — can handle almost any low pressure job. It's designed for pressures up to 720 psi (cwp) and temperatures up to 250° F.



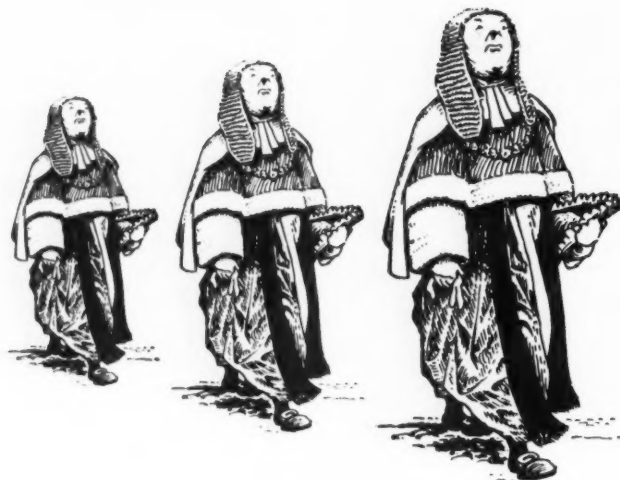
ASA 150 lb. (275 cwp) and ASA 300 lb. (720 cwp)

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The Legal Aspect

MELVIN NORD, P.E.

Consultant in Legal and Technical Problems

Patent Attorney

The Law of Real Property: Condemnation Proceedings

CONSULTANTS should be familiar with the proceedings involved in the condemnation of property.

Types of Proceedings Available

A statutory condemnation proceeding normally is instituted by the state or the agency exercising the power of eminent domain. The purpose of this proceeding is to obtain title to the property (or to an interest in it), and to determine what compensation shall be paid therefor. There is no constitutional requirement that an attempt first be made to obtain the owner's consent to sell before instituting condemnation proceedings. However, it sometimes is required by statute.

One whose property is taken for public use without compensation is deprived of property without due process of law, and he is entitled to a civil remedy to enforce his constitutional rights.

In some instances, an injunction will be available as the remedy, i.e., where the legal remedy is inadequate and injunctive relief is needed in order to prevent irreparable damage.

Notice and Hearing

While the Constitution of the United States does not require a jury trial in condemnation proceedings, or any other specific form of

procedure, the requirements of due process of law necessitate some sort of judicial hearing on the questions of public use, necessity of taking the particular property for this purpose, and just compensation. Furthermore, the constitutions of some states do require jury trials in such proceedings.

Of course, the requirement of a hearing is meaningless unless the owner is given reasonable notice of the hearing, as well as an opportunity to be heard. The type of notice generally is specified by statute, and it need not necessarily be personal service. However, where the owner's address is known, it has been held that a copy of the notice must be sent to him, rather than relying solely on notice by publication in a newspaper.

Compensation

The United States Constitution does not require that compensation be paid in advance. So long as the law makes adequate provision for reasonably prompt determination and payment of compensation, this satisfies the United States Constitution. The constitutions of some states, however, require that compensation be paid or secured before the taking.

In general, compensation must be paid for the taking of any kind

of property or any right or interest in property having a market value. For example, water rights in streams cannot be taken without just compensation. The same is true of building restrictions of a contractual nature, franchises, and fixtures which are so annexed to the land as to be regarded as part of the realty.

Besides the compensation for property actually taken, if there is any injury to the remaining property, that must be compensated for also. To illustrate, an improvement in a public street or highway which bars access thereto by an abutting owner is regarded as an impairment or taking of an easement. But the same is not true with respect to the owner of property which does not abut the street, so long as there remains access to his land from public streets, even though by a circuitous route.

Measure of Compensation

The general measure of compensation is the fair cash market value of the property taken. The amount awarded is measured by the owner's loss, rather than by what the taker has gained.

The adaptability of the land for a special purpose is taken into account in determining compensation, provided it is reflected in the mar-

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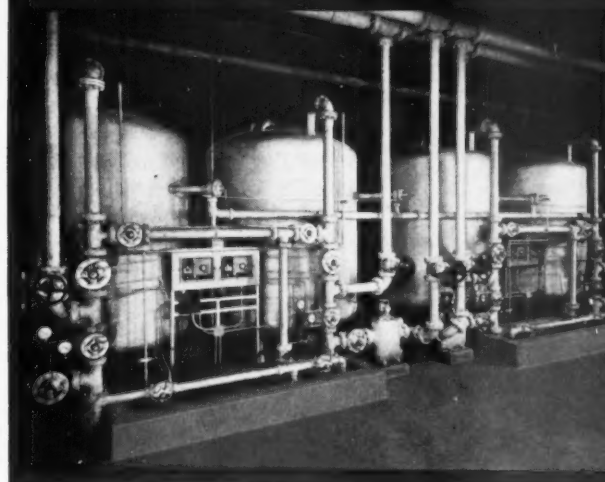
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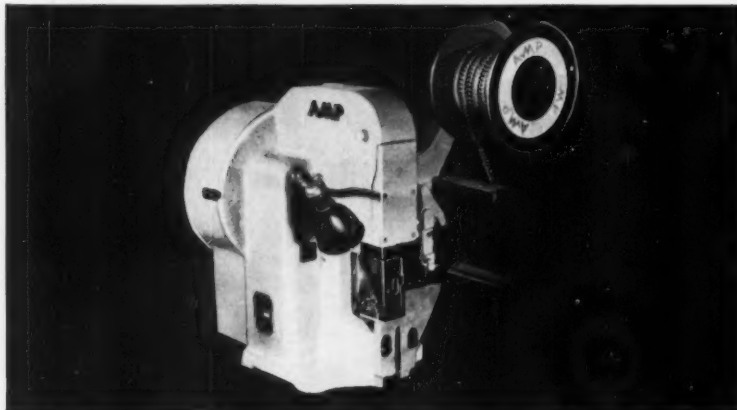
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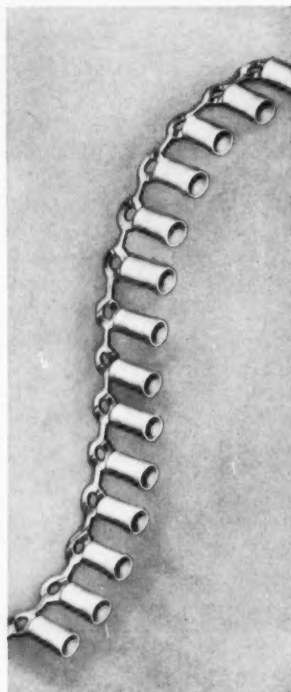
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ket value, but not otherwise. There must be some probability that the land would be used for such special purpose within a reasonable time in order for this element to be included within the compensation.

Where only part of a tract of land is taken, the measure of compensation is the diminution in market value of the entire tract.

Not Compensable

Loss of speculative profits is not allowed as an item of compensation. Loss of profits and good will caused by interruption of a business are generally not compensable, though damages sometimes have been allowed for interruption of a business and its damage due to changed location.

Whether or not benefits to the remaining land must be taken into account as a deduction from the compensation depends to some extent on the statutes.

Who Is Compensated

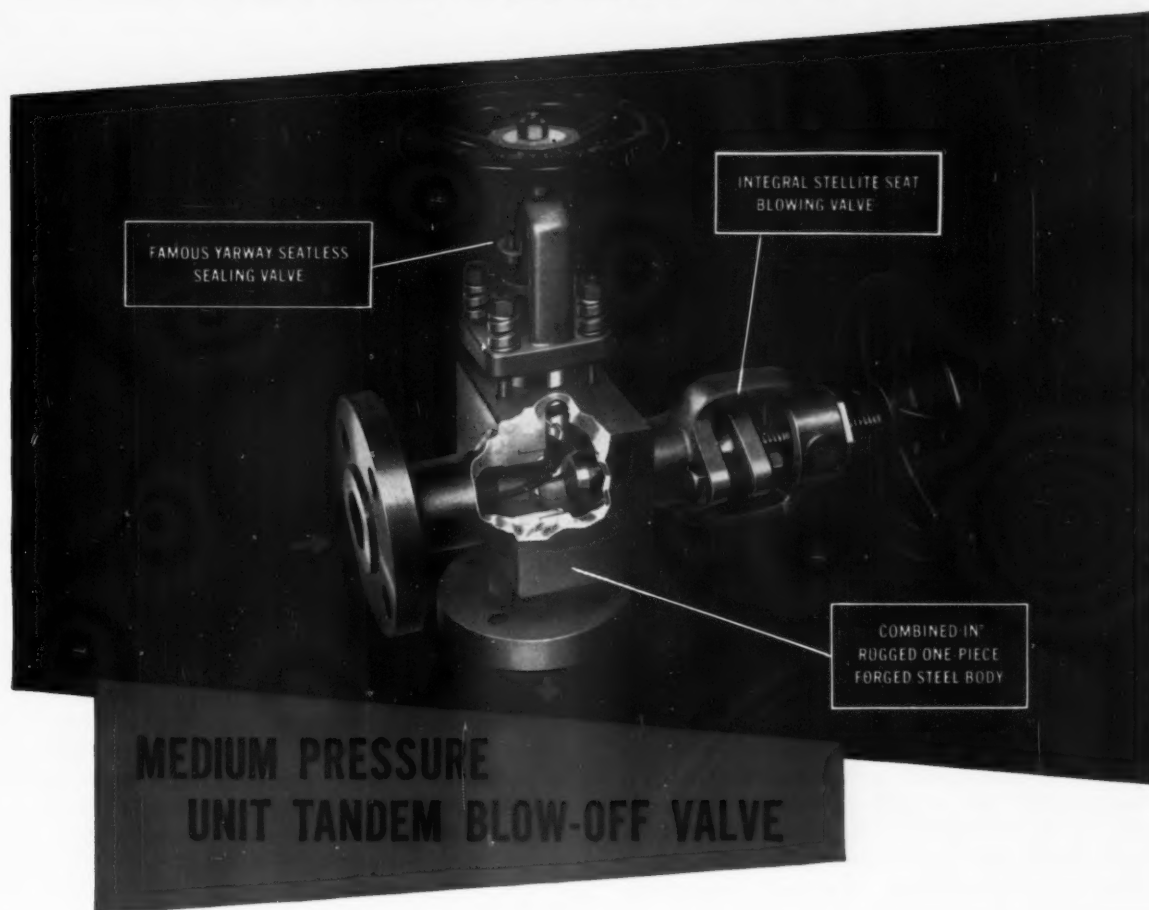
Where there are several persons owning interests in the land, the compensations must be properly apportioned among them. For example, where leased property is taken, both the lessor and the lessee must be compensated for the value of their interests.

The disposal of the compensation when mortgaged property is taken varies from one jurisdiction to another, as well as from case to case. Since the mortgagee's interest in the property is solely for his security, he should not be compensated unless, and only to the extent that, his security has been impaired. ▲▲

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The Sketchbook of Villard

... a flash of light
from the Dark Ages

JAMES KIP FINCH, Dean Emeritus
Renwick Professor of Civil Engineering
Columbia University

THE TEN CENTURIES intervening between the fall of Rome in the 5th Century and the Renaissance of the Cinquecento in Italy have long been known as the Dark or Middle Ages. They once were regarded as a backward and uninteresting interval during which the progress of Western life simply marked time awaiting the development of civilization among the northern tribes that had overrun the Western Roman Empire. Actually, as the fragmentary evidence surviving from this long period of transition and turmoil is being uncovered, this period appears as one of the most interesting chapters in the history of man.

Unfortunately little is known regarding the training and conditions faced by the medieval master builder. The Roman public official, competent to initiate and direct works in cooperation with the *architectus* and other technical assistants, had passed from the scene. Both architecture and engineering, as we know them today, were to evolve gradually from the status of craftsmanship, and neither achieved anything resembling professional standing until the Italian Renaissance.

That the medieval craftsman must have been a man of extraordinary ingenuity, skill, and daring, a man of truly remarkable practical abilities and constructive resources, is obvious. He was responsible for the massive medieval castle, the impreg-

nable fortress-home of the era of private wars which followed the breakup of Charlemagne's Empire of 771-814. In sharp contrast, he planned and built the slender and daring stone constructions represented by the Gothic cathedrals of the 12th Century — those bird cages in stone in which the loads and thrusts of lofty vaulting were brought safely to earth without benefit of modern stress analysis or tests of materials.

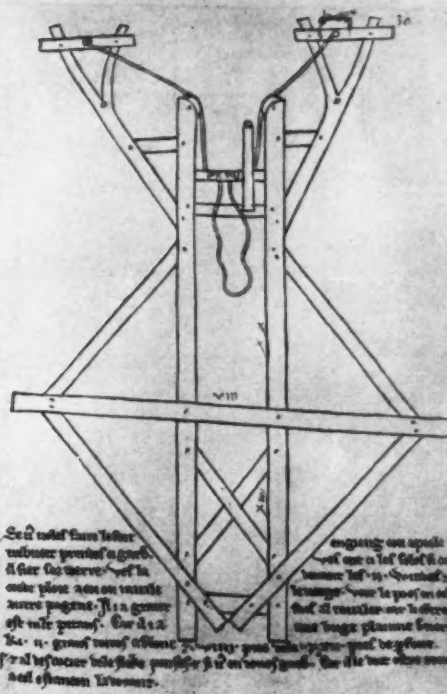
De Honnecourt's Sketches

The major portion of the sketch and note records of one architectural-engineering worker of this period has miraculously survived the hazards of the centuries. During the French Revolution a small book of some 60-vellum pages, about 6 inches by 9 inches in size and bound in a well worn flap-around leather cover, was discovered in the famous old Abbey of St. Germain des Pres, in Paris, the chapel of which still is standing. It found its way into the French National Library and was reproduced in facsimile with a translation by Robert Willis, in London, in 1859. A brief edition, edited by Theodore Bowie, has been published recently (1959) by Indiana University, and is distributed by George Wittenborn, Inc., New York, (\$2.00).

The author and artist, Villard de Honnecourt, evidently came from a small town near Cambrai, in Northern France. His notebook, largely a collec-

de Honnecourt

Fig. 1 — "If you wish to build that strong engine called the catapult, pay close attention. Here is the base as it rests on the ground. In front are the two windlasses and the double rope by which the pole is hauled down, as you may see on another page. The weight which must be hauled back is very great, for the counterpoise is very heavy, being a hopper full of earth. This is fully two fathoms long, eight feet wide, and twelve feet deep. Remember that before the bolt is discharged, it must rest on the front stanchion."



tion of sketches made in his travels, dates from about 1230, the later years of the fortress and cathedral building era. He begins his notes with a personal greeting. "Villard de Honnecourt greets you and begs all who will use the devices found in this book to pray for his soul and remember him. For in this book will be found sound advice on the virtues of masonry and the uses of carpentry. You will also find strong help in drawing figures according to . . . the art of geometry."

A number of the pages of the book are clearly missing, cut out at some time in the past. Of the 63 that remain, 35 and parts of some 6 more are devoted to drawings of figures — apostles, saints, and others of religious interest. Architectural plans of cathedrals also are found in 16 plates, while masonry, carpentry, and machines take 8 plates plus parts of 2 others — added in where space was available. The figure drawings are far better than those illustrating more practical matters. Though of special engineering interest, they are crudely drawn.

Engineering Coverage Limited in Scope

Clearly the author's major interest was church architecture. One must turn elsewhere for data on other great medieval construction. Early hand illuminated books show fortresses of which impressive ruins still remain, but there is no contemporary work on them. The standard reference is the

10-volume *Dictionnaire de l'Architecture Francaise du XI and XVI Siècle*, of Viollet-le-Duc, published in 1865. The part of this work dealing with military matters has been translated into English and covers the great fortress of Cluny, which was completed in 1230 when de Honnecourt was active, and which M. le Duc regards as "the most superb military construction of the Middle Ages." Yet de Honnecourt tells us nothing of these defensive works with their moats and drawbridges, their portcullis gates and their great keep. On the other hand he does describe one of the great stone throwers of pregunpowder days, a type of device that was used to batter down fortresses.

Unfortunately, de Honnecourt's few notes in early Latin-French, offer little aid in explaining his sketches. They are usually brief labels. His note on the catapult (Fig. 1) is longer than most, but is of little help since the other page to which he refers is missing. Thus we are left in the dark as to important details of what M. le Duc hails as "an enormous engine." In his *Dictionnaire* he offers a reconstruction of this device based on de Honnecourt but also using, he says, "a number of vignettes from manuscripts which enable us to complete the drawing" — and, it might be added, by drawing freely on his own imagination.

The war machines, nevertheless, continued in use until well into the 15th Century, and it was from

the use of the term "engine," used to describe them, that the title engineer evolved. Apparently an early Christian author, Tertullian, about 200 A.D., was the first to refer to one of these devices as an ingenium or product of genius. Thus, by de Honne-court's day, not only were these machines known as "engines" but the men who designed and operated them were frequently called *ingeniators* or *engegneurs*.

Military Engineering

On another page of the sketch book, a problem of special military interest is illustrated by a crude outline of a framework of sticks: "How to measure the width of a watercourse without crossing it" (Fig. 2). Apparently the two sides of the frame were to be adjusted to sight a point on the distant shore, the frame was then to be turned and a point sighted to which the distance could be measured. This problem, basically that of determining the distance to an inaccessible object, became of vital importance with the later increasing use of cannon, and, together with attempts to predict the trajectory of shot, was to lead to an emphasis on military sur-

Fig. 2 — "a. How to measure the diameter of a column, only part of which is visible. b. How to find the mid-point of a drawn circle. c. How to cut the mold of a three-foot arch. d. How to arch a vault with an outer centering. e. How to make an apse with twelve windows. f. How to cut the springing-stone of an arch. g. How to bring together two stones if they are not too far apart. h. How to cut a voussoir for a round building. i. How to cut an oblique voussoir. j. How to make a bridge over water, with twenty-foot timbers. k. How to lay out a cloister with its galleries and courtyard. l. How to measure the width of a watercourse without crossing it. m. How to measure the width of a distant window. n. How to place the four cornerstones of a cloister without plumb line or level. o. How to divide a stone so that each of its halves is square. p. How to shape the screw of a press. q. How to make two vessels so that one holds more . . . r. How to cut a regular voussoir.

Fig. 3 — "a. How to make regular pendants. Place it upside down. b. How to obtain the diameter of a round object by placing it in a corner. c. and d." (Captions reversed.) "How to gauge a right angle and how to make the keystone of a tierce-point arch. e. How to make the keystone of a fifth-point arch. f. Archimedes' spiral. g. How to join a four-cornered pillar. h. How to cut a voussoir by echelons. i. By this method is the spire of a church raised and its mold cut. j. How to cut the voussoirs of hanging arches. k. How to set up two pillars of the same height without plumb line or level. l. How to measure the height of a tower." (Note man.)

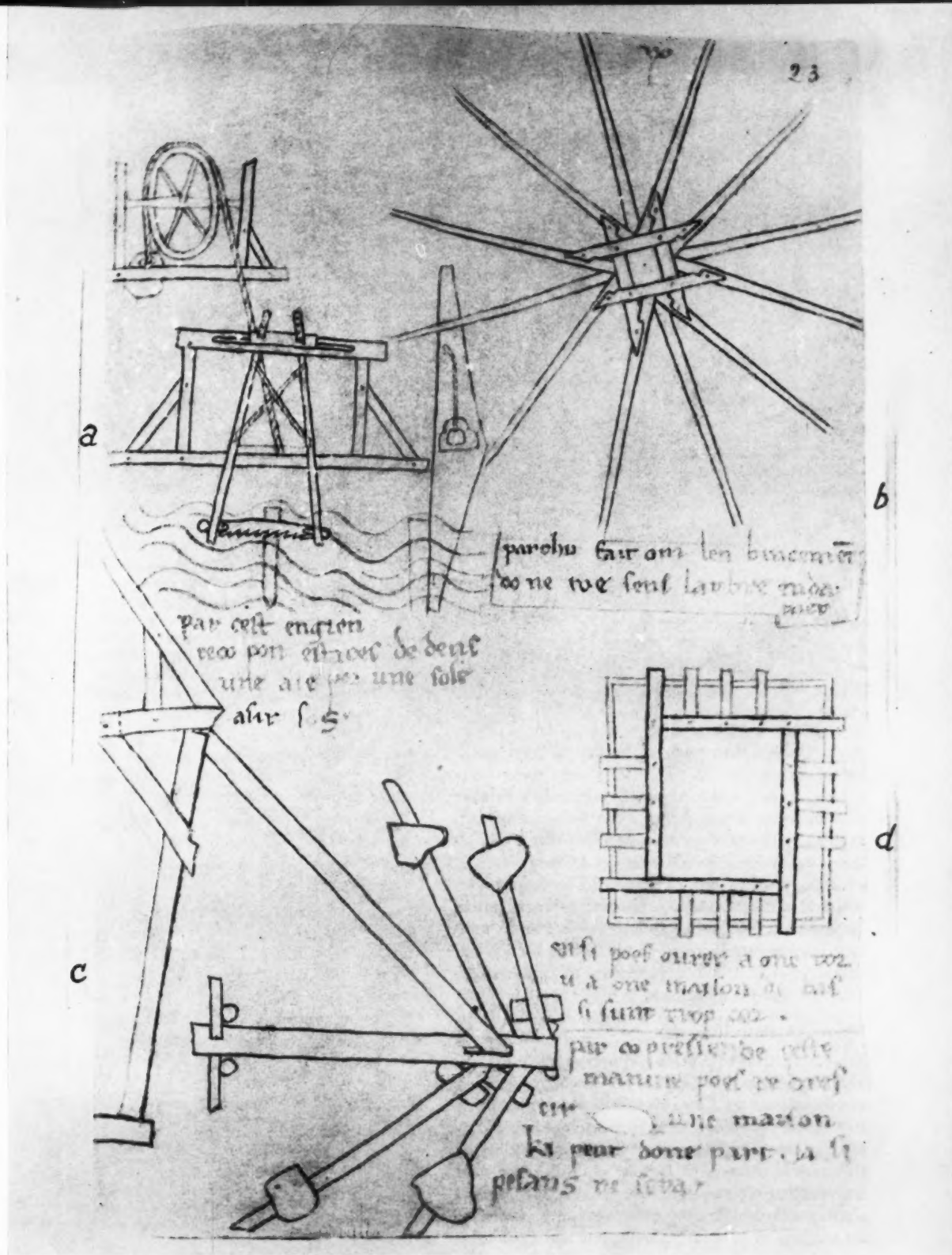


Fig. 4 — "a. By this means, one can cut off the tops of piles under water so as to set a pier on them. b. How to brace the spokes of a wheel without cutting the shaft. c. How to straighten up a sagging house by using this kind of strut. d. How to work on a house or tower even if the timbers are too short."

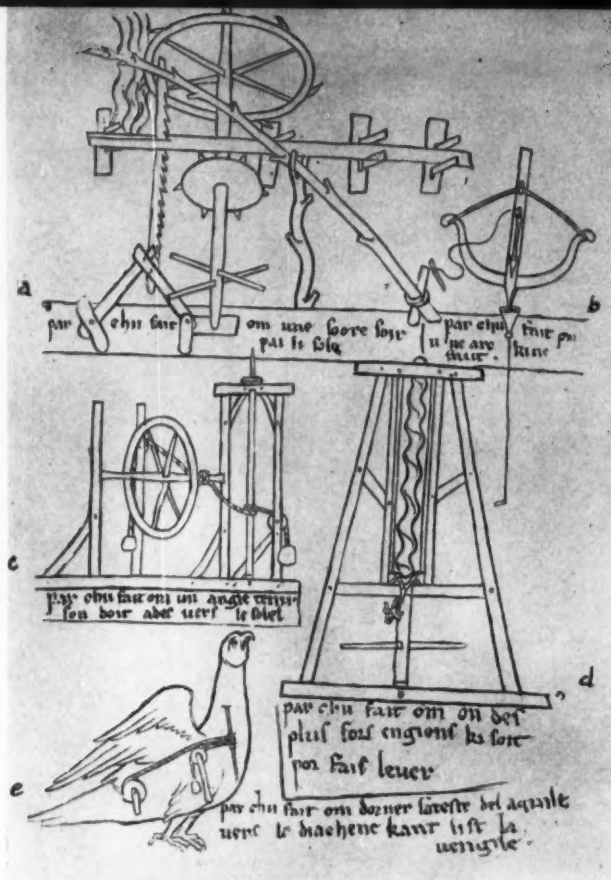


Fig. 5 — "a. How to make a saw operate itself. b. How to make a crossbow which never misses. c. How to make an angel keep pointing his finger toward the sun. d. How to make the most powerful engine for lifting weights. e. How to make the eagle face the Deacon while the Gospel is being read."

veying which characterized the first printed works on this subject.

Gunpowder and cannon also introduced other new interests. Thus, through the influence of men such as de Honnecourt, it came about that constructions that we now would consider in the domain of civil engineering long continued to be linked with architectural interests. During the later Italian Renaissance, the new techniques peculiar to military engineering were to result in this branch becoming the first engineering area to achieve separate recognition and status.

Church Architecture

When one turns to de Honnecourt's notes on church architecture, his several pages of rough sketches are disappointing. They offer little aid in answering two major questions of cathedral building: How did the medieval craftsman learn to handle the thrusts and stresses of Gothic vaulting, and what construction technique did he use? De Honnecourt shows us sketch-plans of cathedrals and some similar outlines of column arrangement and vaulting — none drawn to scale. Indeed it seems clear that no adequate dimensioned drawings such as those used today were prepared. Yet the nave of the Gothic cathedral was formed by a series of stone bents in which the weight of the roof and high vaulting,

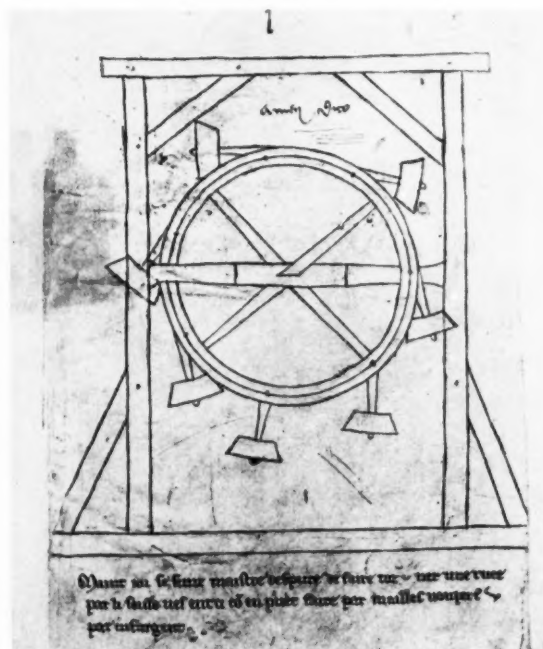


Fig. 6 — "Often have experts striven to make a wheel turn of its own accord. Here is a way to do it with an uneven number of mallets and with quicksilver." (To which another handwriting has added: "I say Amen.")



Fig. 7 — "Here below are the figures of the Wheel of Fortune, all seven of them correctly pictured." Under the Wheel of Fortune, two recipes are given: one for a ceramic paste, and the second one for a depilatory.

often rising 100 feet or more above the floor, was supported effectively on tall, slender columns, and the thrusts were balanced and brought to earth by side bracing, flying arches, and buttress piers.

In general plan and form these skeleton-stone constructions were based on the earlier Roman basilica, and they had evolved through the round-arch Romanesque style which preceded the Gothic. Yet, in daring and skillful design they are without parallel. Their builders undoubtedly learned through trial and error. Apparently the use of the high, pointed Gothic arch avoided the need for extensive and complete centering. Some failures are recorded, but the greatest triumphs of the day have endured through the centuries.

Construction Methods and Tools

In connection with the work of the stonemason, de Honnecourt does deal with basic problems in a number of crude sketches (see Figs. 2 & 3), though one of his followers apparently inserted the qualification, "All these devices are extracted from geometry." Scholars are agreed that this odd remark must mean the sketches were copied from some technical handbook devoted to problems of practical geometry.

On another page (Fig. 4) he surprises us by illustrating an unusual technique for founding bridge

piers, which was later to be developed in the 17th Century, in France. He shows a saw mounted on a frame, arranged for squaring off the tops of piles under water.

In the area of carpentry his notes also record two or three forms of roof covering — rafters with quite useless attached "hanging beams" which make it clear that he had no conception of effective bracing and truss action even though he says, "Here you may see the right kind of roof to place over a vaulted chapel."

One fascinating page in this ancient record contains a curious collection of mechanical devices (Fig. 5) that reflects the growing interest in machines. Still another sketch, which, like the others, lacks adequate explanation, shows a wheel with hinged mallets (Fig. 6) and illustrates the early interest of mechanically-minded men in the impossible — perpetual motion.

A design for a "Wheel of Fortune" (Fig. 7) gives this Gothic craftsman an opportunity to exercise his interest in artistic design and figure drawing. Surprisingly, it is followed on the same page by a formula that records the long-continued effort to secure a cement mixture which, like the ancient but geographically limited pozzuolanic ash of Roman times, would aid in improving the setting qualities of lime. "Take lime and powdered pagan tile in equal quantities, adding a little more of the latter until its color predominates. Moisten this cement with linseed oil, and with it you can make a vessel that will hold water."

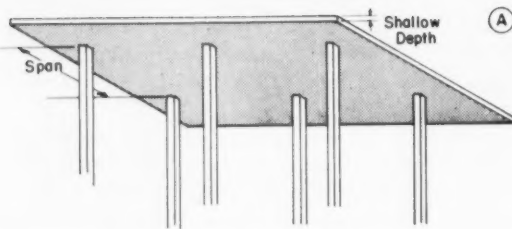
Varied Background

These notes thus constitute a curious, fragmentary, but nevertheless fascinating and stimulating record of the interests and activities of the medieval craftsman, cathedral builder, and *ingeniator*. De Honnecourt was evidently a man of some education in his day, an age when few could read or write. He combined, as Vitruvius had advised, first-hand familiarity with craftsman skills and an evolving technical interest.

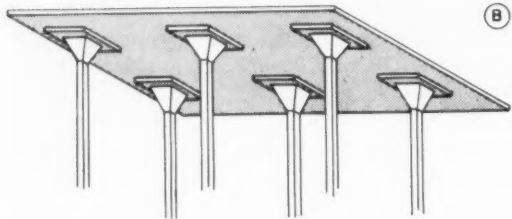
That he traveled widely is also clear, moving from place to place through France as opportunities for employment opened up, and also visiting Hungary, presumably on some building mission. To round out his diverse personality, he indicates an avid interest in the taming of lions. The connection between this occupation and cathedral building is not clear. Perhaps it was good training for dealing with medieval contractors.

One can only regret the omissions and the loss of the missing pages of this brief but valuable record of a vital period in the history of Western Civilization and in the evolution of the engineering profession. ▲▲

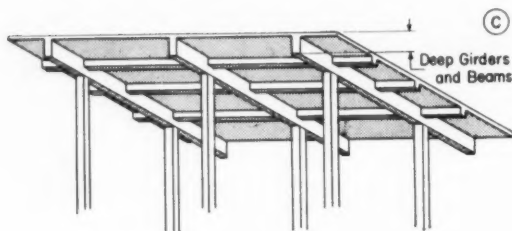
Designing Flat



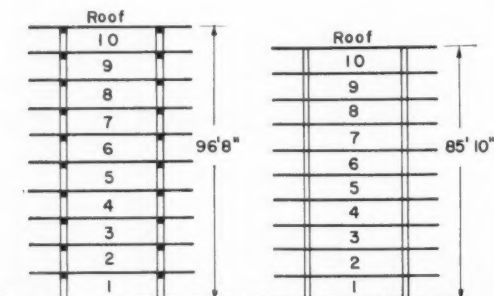
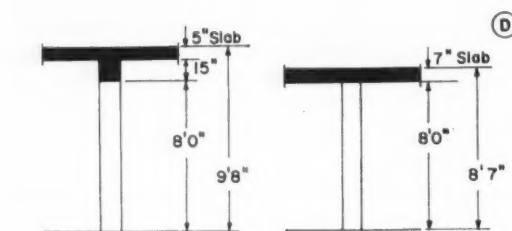
Flat Plate
Depth to Span Ratio is Small



Flat Slab
Depth to Span Ratio is Small



Beam and Girder
Depth to Span Ratio is Large



E. VERNON KONKEL
Ketchum, Konkell & Hastings



FLAT SLABS AND FLAT PLATES are in common use in many structures, for they make possible a fireproof structure with maximum initial economy. However, the deflection characteristics of this type of floor system have not always been thoroughly understood. As a result, many architects, engineers, and owners have been dissatisfied with their performance.

Advantages

To the credit of this design, no other type of construction will result in so shallow a structural system. Flat plate (A) or flat slab (B) floors provide a structure of minimum story height, allowing stairs with fewer risers and treads and less space for stairwells. Also, this system allows a minimum height of exterior and interior walls, shorter elevator shafts and pipe risers, and a minimum cubage for all building materials. In addition there is a smaller volume to be heated and cooled.

Forming is simpler and less costly than for any other type of concrete structure (C).

If the mechanical or electrical systems do not require ducts which have to be hidden by a suspended ceiling, the flat, flush underside of the flat plate may serve as a base for paint or plaster, saving the cost of a suspended ceiling. Some conduits can be run in the slab. If there is a suspended ceiling, the mechanical and electrical engineers and contractors like the system, since no beams protrude below the slab to interfere with duct or pipe runs.

The construction is fireproof, requiring no additional treatment.

Plates and Slabs

E. Vernon Konkel received his B. S. degree in Architectural Engineering (1948) and M.S. degree in Civil Engineering with a major in structures (1955) from the University of Colorado. During the years 1943-1945 he was a Lt. (j.g.) Pilot in the U. S. Navy, and after work with the USBR and C. H. Coberly, Consulting Engineer, he was employed by Milo S. Ketchum as a structural engineer. In 1953 he was made an associate in the firm and in 1954 a partner. Konkel is President Elect of the Professional Engineers of Colorado and National Director of the Consulting Engineers Council. He has served as President of the Structural Engineers Association of Colorado and Chairman of the Structural Division of ASCE of Colorado.

A structure of this design may allow an additional story where zoning requirements restrict total building height (*D*).

Disadvantages

On the debit side we have the problem of deflections. Serious deflections may occur in both flat slabs and flat plates, though the deflections in flat slabs are somewhat less critical because of the additional depth of the drop panels at columns and the greater stiffness afforded by the column caps.

While serious deflections do not always occur in flat slabs and plates, they are apt to occur more frequently than in other concrete floor systems because of their extremely shallow structural depth. With many factors to control, a prediction during the design stage as to the ultimate behavior of a flat slab is, at best, difficult. None of the individual causes of deflections in flat slabs are serious and certain in themselves. However, the deflections may

accumulate to a point where they become serious from an appearance standpoint, even when they do not indicate structural defects. It may take as long as five years for a flat slab to reach final stability, but possibly 75 percent of the deflection will occur in the first year after loading, while 90 to 95 percent should occur within the first three years.

Causes of Deflection

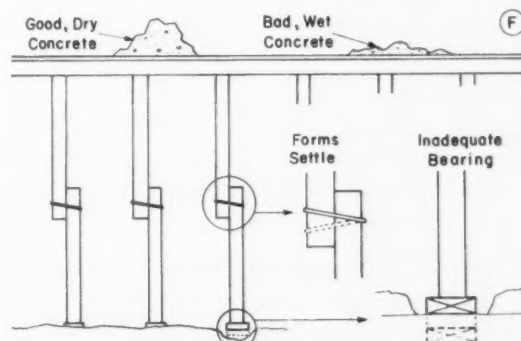
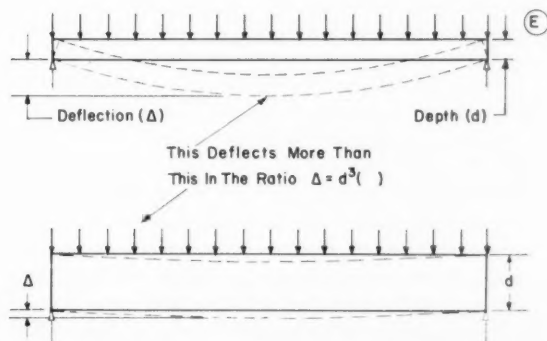
If the slab thickness is not carefully maintained, the deflection will increase more rapidly than the percentage change in the slab thickness, since the deflection varies as the depth cubed (*E*). If a supposed 6-in. slab has an actual thickness of only 5½ inches, the percent change in the deflection would be $(6 \div 5.5)^3 = 1.30$, or 30 percent.

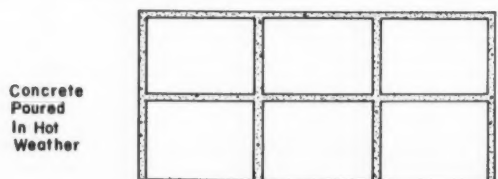
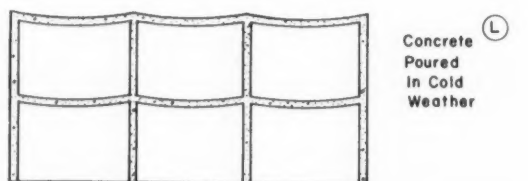
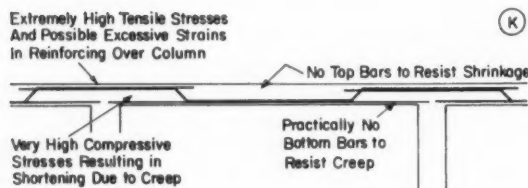
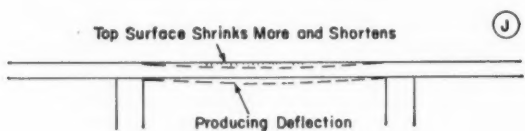
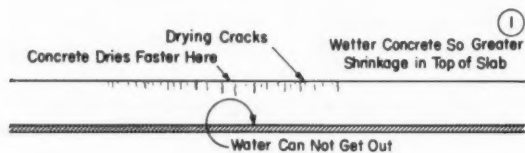
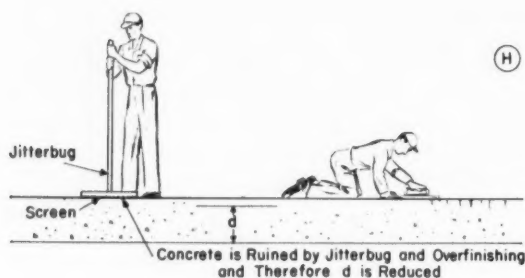
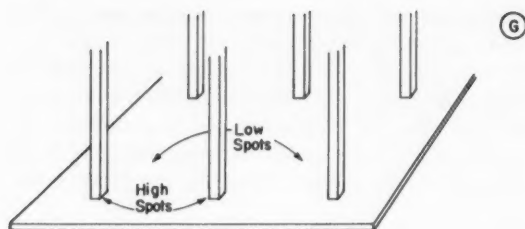
No two batches of concrete are identical (*F*). Cements, sands, and gravels vary considerably, materially affecting the properties of the concrete. The amount of water added to the mix and the amount of water held by the aggregate is vitally important to the properties of the hardened concrete. Because of these and other variables, the modulus of elasticity, or stiffness of the concrete, cannot be predicted accurately. Since deflection is inversely proportional to the modulus of elasticity, its assumed value is extremely critical.

Forms may settle if not properly constructed (*F*). If forms are founded on mud sills, they may settle as a result of poor soil, or wetting of the soil by snow or rain, or water used on the structure for curing the concrete.

Finishers almost invariably finish monolithic slabs high at the columns. They cannot finish a monolithic slab perfectly level, and a slab one-half inch out of level is not unusual (*G*). The thickness of the slab also may be reduced.

After the concrete is placed and struck off to elevation, the finishers use a tool called a "jitter-bug" to force the large aggregate down into the slab, thus leaving about a half inch of fines, cement, and water at the top. This process makes the floating and troweling easier. Jitterbugging, floating,





and troweling (H) — as well as natural bleeding action — encourage the water to pull to the top of the slab with the fines and cement. The result is concrete of very inferior quality at the top surface. In effect, this reduces the slab thickness and permits larger deflections.

The forms under the slab also may get wet and swell to form a barrier so that the slab dries faster on the top than on the bottom (I). This makes drying shrinkage greater in the top than in the bottom surface. In addition, the bleeding and finishing operations add to this tendency for greater top shrinkage. This result is similar to the curling of a slab on grade. The greater shrinkage in the top of the slab results in a shortened surface and the edges raise up or curl. The dished contour may add seriously to the over-all deflection (J).

Unfortunately the reinforcing pattern of a flat slab (K) is such that it does not offset the effect of shrinkage or creep. There are no top bars in the middle of the slab to resist the shrinkage and subsequent shortening of the top portions.

The property of concrete known as creep, or plastic flow, or time yield, results in greater deflections in flat slab structures than in most other designs. In the middle of the span where positive moments occur, the stresses are fairly normal, and the creep deflection is similar to other concrete structures. The negative moments at the column provide a different story. Since the whole slab is supported by a very small column, the bending stresses are high. Even though the ACI Code permits $\frac{1}{4}$ of the width of the column strip, or the whole column strip, to be used in computing compressive stress, the maximum stresses are still extremely high close to the column. This results in a considerable creep in this area and causes large deflections in the slab. Again, the usual reinforcing pattern does not prevent these deflections, since practically no compressive reinforcing is supplied at the column.

The extremely high stresses at the columns may result in excessive strains in the negative reinforcing over the column, and the bars at this point may well be stressed above their yield point. The structure then readjusts, and the load is carried more in conformance with the reinforcing pattern.

Stiffness of concrete does not always increase in the same ratio as the strength. This is particularly true in cold weather. The results of beam tests on several jobs that we have had show that the stiffness may not increase at all when the average temperature is 40 F although the concrete will continue to gain strength slowly. Thus, if it is necessary to remove the shores under a slab in order for the work on the project to progress according to schedule, the result, in cold weather, is almost invariably

excessive deflection (*L*). The importance of this can hardly be overstated.

Suggested Solutions

The question then arises as to what can be done to minimize these deflections. One approach, and one of the best is the use of topping (*M*) rather than a monolithic slab. The structural slab then will be screeded only. Most of the damage done by finishing and overfinishing will be eliminated, in effect providing a thicker, more uniform slab of better quality concrete. Dead load elastic deflection and some of the shrinkage and creep deflections will already have occurred before topping is placed. Also, it can be placed towards the end of the job in small sections out of the sun, wind, and rain. These precautions result in a more level slab. Unfortunately, topping adds 1½ inches or so to the depth of the system and requires extra reinforcing. There is some debate, but most contractors think the topping method is more expensive.

It is possible, of course, to use a thicker slab. This takes more concrete and steel, and bigger columns and foundations. It may be worth the extra money on many projects.

Compressive reinforcement will minimize shrinkage and creep. A few bars (*N*), properly placed, add little to the cost and much to the appearance and quality of the finished structure.

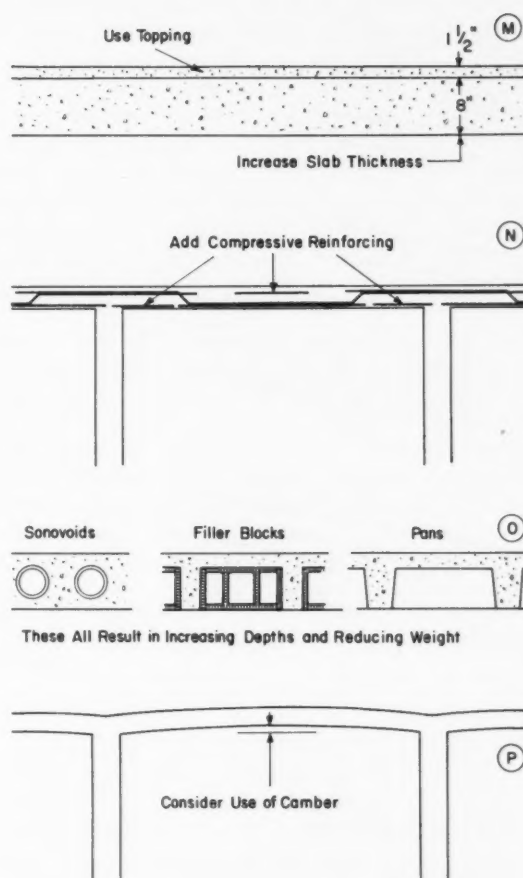
Consider seriously the use of lightweight concrete. It is difficult to force the larger aggregates down in the slab, since they tend to float, and some lightweight concrete bleeds less than stone concrete. The aggregate is also more uniform and absorbs less moisture during storage than most aggregates. In addition, the water content is easier to control. A more uniform concrete results. Shrinkage and creep characteristics may be better, because the much lighter concrete reduces stresses (and therefore creep) in a slab of equal thickness.

Weight reduction by the use of filler blocks, pans, or Sonovoids (*O*) often will give similar favorable reduction of stresses and creep and always should be considered.

It is desirable to pour the concrete as dry as possible. As a further precaution, eliminate the jitterbug and finish as little as possible.

Keep heat on the slab in cold weather for as long as possible, preferably for as long as 90 days. In cold weather it is essential that shores remain in place longer. Again, 90 days is desirable, even when the slab is heated. Regardless of the temperature, shores should be left in as long as possible.

Cure the slab as much as possible. Tighter specifications and good field supervision can accomplish this at a small increase in the cost of the structure. Also, you can specify better quality concrete with-



out adding cement, though it will cost more money.

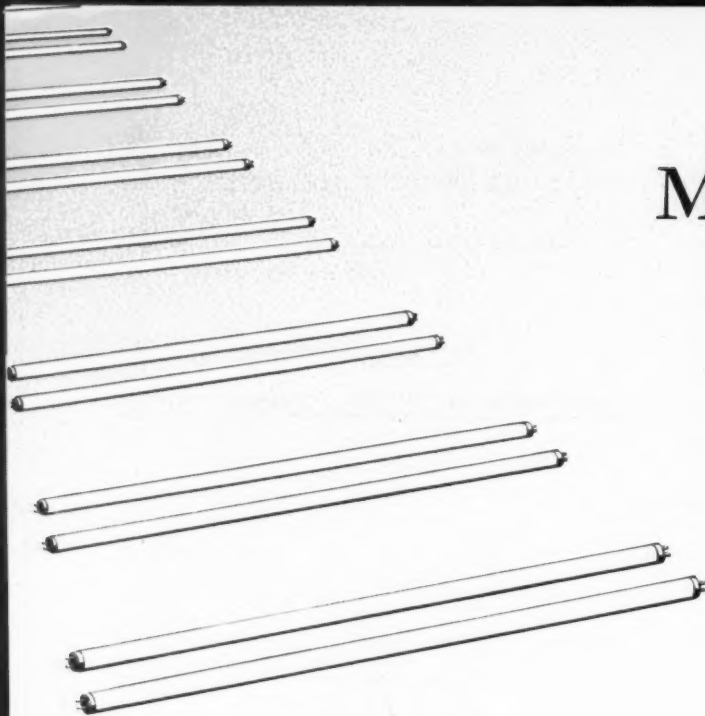
Specify that the contractor should check the slab for level just after the concrete takes its initial set and fill to level immediately. The fill will bond to the slab and cure out monolithically. This is expensive, but may greatly improve the level of the slab.

Camber (*P*) should be used in certain instances, but it does not always help because there are too many variables to predict deflections accurately.

In addition to everything else, there are elastic deflections. These are usually small and unlike other factors can be computed and predicted accurately if the proper modulus of elasticity can be determined.

In summary, there are many modern structures where a flat plate or flat slab provides an economical and structurally sound solution. Deflections should be anticipated and the owner advised as to initial cost savings and expected maintenance, such as patching and painting of partitions and reworking doors and windows so they will operate. Deflection can be reduced considerably, however, by good concrete practice and careful design, specifications, and field supervision. ▲▲

More Light With Less Heat



ERNEST F. SIEGEL
Chief Mechanical-Electrical Engineer
Green Associates, Inc.



CE exclusive THE DEVELOPMENT of efficient fluorescent fixtures gave the designer a tool with which he could effectively and economically increase lighting intensities. The findings of many research projects on the subject of lighting have shown that increased levels of illumination permit more effective performance of various industrial and administrative tasks and result in increased employee productivity. These findings were substantiated in actual applications. Industry has found that the cost of substantial increases in levels of illumination can be amortized rapidly from the savings resulting from increased employee productivity. This increased productivity can be attributed to decreased employee fatigue, which is tantamount to greater output, with reduced errors and fewer rejects.

Aside from economic consideration, increased lighting intensity levels have become a necessity in many industries, such as electronics, machine tools, and optics, where manufacturing tolerances are critical and superior visibility is a basic requirement. Greater physical comfort of the occupants of well-lighted areas is an important by-product.

Change in Footcandle Levels

Footcandle levels, which afford a reasonably accurate measure of lighting intensities, have risen

rapidly. Table 1 shows comparative minimum requirements as published for 1950 and 1959 by various industrial and lighting handbooks. The changes in these minimum requirements over the relatively short period is noteworthy.

Most of the examples listed show a 100 percent increase in lighting levels over the past nine years. Many more could be shown to indicate the same trend. The change was accentuated recently when the results of an eight-year research program conducted by Dr. H. Richard Blackwell were published. Dr. Blackwell recommended footcandle levels for various tasks and his recommendations have, in general, been made part of the recommended practice by the Illuminating Engineers Society in connection with considerations of "quantity of illumination." Since a definite ratio exists between task illumination levels and the general illumination in an area in which a specific task is performed, the acceptance of Dr. Blackwell's recommendations will have a decided effect on general illumination levels as well.

The new standards, as well as the changes in illuminating levels over the past ten years, represent a great improvement in the visual living standard. They will, no doubt, increase productivity, reduce eye strain, and make life more pleasant in general. It is reasonable to assume that the trend towards

TABLE 1
RECOMMENDED FOOTCANDLE LEVELS
(MAINTAINED)

Area	1950	1959
Offices (General)	30	70
Offices (Drafting)	50	100 +
Bank Lobbies	20	50
Teller Areas	50	100
Stores (General Merchandising)	40	100
Barber Shops	40-50	80-100
Shops (General Assembly Work)	30-40	70-100
Welding Shops (General Illumination)	30	50
Courtrooms (General Illumination)	20	30-60
Hospitals (Patients' Rooms)	20	30
Hospitals (Utility Rooms)	10	20-30
Libraries (Reading)	30-50	40-70

increased illumination will continue in the future, possibly at a somewhat decreased rate. We certainly can state that lighting levels as recommended by IES can no longer be considered luxury levels but must be looked upon as minimum requirements in future building design.

The Hidden Cost of Illumination

It is well known that high illumination levels affect the quantitative requirements for air conditioning installed in modern buildings. Just as good lighting is a necessity for the efficient performance of the modern worker, so is air conditioning. Increased lighting requires larger and more costly air conditioning systems and causes the distribution of cooling media to become progressively more difficult. ¶ Increased illumination means increased dissipation of power within the illuminated space.

¶ For each kw of increased power, approximately 3413 Btu/hr must be dissipated — more than $\frac{1}{4}$ ton additional refrigeration capacity must be supplied.

¶ Each additional ton of refrigeration in turn requires additional facilities for the proper distribution of the cooling medium.

¶ Additional light fixtures in a ceiling take up space which formerly was allotted for ductwork, diffusers, or radiant panels, thus making the problem of distribution more difficult.

The mechanical engineer, charged with the design of air conditioning for modern buildings has bravely fought the Battle of Distribution. He has developed new systems of distribution for air and chilled water including high velocity systems, underfloor systems, and perimeter systems, but he finds that these systems cannot cope fully with the problem. He has discovered that there is precious little room for diffusers and ductwork between the forest

of lighting fixtures, and the heat gain from these fixtures forces him to design refrigeration plants of gigantic proportions for many projects.

Owners and operators are also apprehensive of the additional first costs and operating expenses of larger and larger air conditioning plants. While they realize the need for better lighting and are willing to pay for it, they find the secondary cost, resulting from increased air conditioning and increased story height, a heavy economic burden.

Typical Problem

Let us examine the effect of increased lighting intensity on the installation and operating costs of air conditioning by looking at a typical interior office space. An interior space was chosen in order to eliminate the varying effect of sun loads and transmission loads through outside walls and windows, but an analysis of office spaces located adjacent to exterior walls would show similar results. It is assumed that the space under consideration is located on the second floor of a multistory building and that the spaces above and below are air conditioned. Under those conditions the net heat gain to and

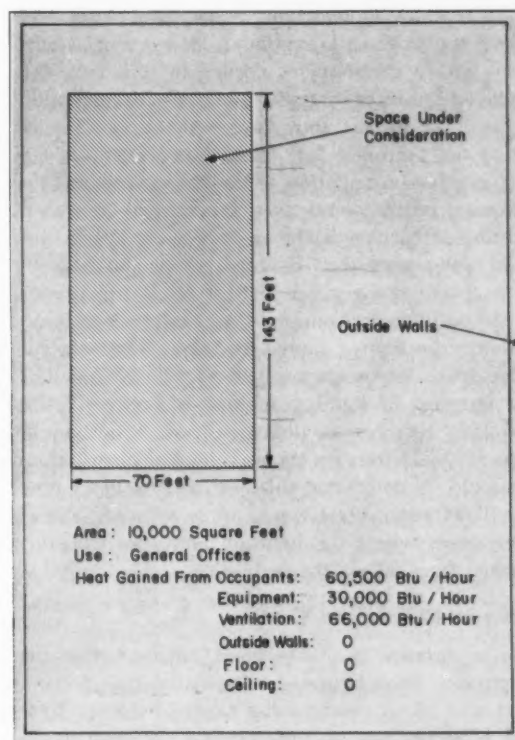


Fig. 1 — Air conditioned interior office space selected as example has no heat gain through walls, floor, or ceiling since surrounding spaces are also air conditioned. All lighting fixtures are fluorescent type.

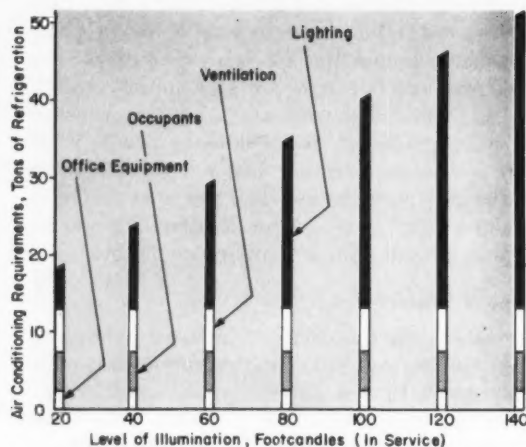


Fig. 2 — Air conditioning in tons of refrigeration to compensate for heat gain at various levels for conditions encountered in office space of Fig. 1.

from other floors is zero. It is further assumed that the space is subdivided into large and small offices and that the average room index (as defined by IES) is "F", which corresponds to an average office of 16 feet by 30 feet with lights mounted 9 feet above the floor. All lighting is fluorescent equipment with a maintenance coefficient of 0.65 and a coefficient of utilization of 0.40. Lamps are assumed to be T-12 instant start cool white units. Fig. 1 shows the pertinent data for this example.

A graphic presentation of the changes of air conditioning requirements as a function of increased lighting intensities is shown in Fig. 2. While this chart was prepared on the basis of specific assumptions listed, the general picture holds true under most conditions encountered in modern buildings.

Using the figures shown in Table 1 for general office space in connection with Fig. 2, we find that the increase in lighting intensities between 1950 and 1959 requires an increase in air conditioning capacity of 11 tons for the area under construction. It should be noted that this net increase of 11 tons per 10,000 square feet would apply to most general office areas where the lighting intensities were increased from 30 to 70 footcandles.

Costs in Dollars and Cents

The importance of this increase can be better understood if these figures are translated into dollars. First cost of air conditioning ranges between \$500 and \$750 per ton of refrigeration on large, well-designed systems. Assuming a cost of \$600 per ton, the increase in first costs of air conditioning equipment attributable to the increase in footcandle level is in the vicinity of \$6600, or \$0.66 per square foot

of office space. This alone will raise hair on the bald head of any real estate holder or prospective owner of rental property.

In addition, operating expenses must be considered. These will vary with the type and size of air conditioning system installed, with the prevailing utility rates, and with the geographic location of the installation. However, a figure of \$30.00 per ton per season might be considered reasonable. Thus, the operating expenses for the 11 tons of refrigeration will be approximately \$330 per year or \$0.033 per square foot per year. This will rapidly turn grey the newly grown hair.

Are we then committed to this higher cost, since we certainly do not wish to regress to the Dark Ages of 20 footcandles? No, we are not, provided we understand the problem and attack it with engineering resourcefulness.

Methods for Cost Reductions

There are several avenues to at least a partial solution. One approach is to make our light sources more efficient, that is, to obtain more lumens per watt. We can accomplish this by using high frequency (400 cycle or higher) power supplies, by installing more efficient lamps, or by using a combination of the two. Considerable research and development work is in progress in these directions and much of it has borne fruit.

The consultant charged with the design of the electrical systems for buildings should, in the interest of his client's pocketbook, use these advances as rapidly as they become feasible.

There are, however, several other means which should be investigated by mechanical and electrical consultants in a joint effort to reduce the hidden cost resulting from our high standard of vision. The first and simplest object of our attention should be the fixture ballast. We know that ballasts for fluorescent fixtures need not be mounted in individual fixtures but can be combined and mounted in non-air conditioned, strategically located utility areas within any building. This not only would eliminate heat gain from ballasts but also would do away with ballast noise in occupied areas and would make ballast service less expensive. The heat gain from ballast is estimated at 17 percent of the power input to each fixture.

Table 2 shows the effect of increased levels of illumination on the first cost and operating expense of air conditioning equipment serving the illuminated space. The figures in Lines 4 and 6 may seem small, but it must be remembered that they represent cost per 10,000 square feet. When a building with 100,000 square feet of air conditioned floor space is considered, we find that these figures are substantial. For example, at 80 footcandles average

TABLE 2
AIR CONDITIONING CAPACITY, FIRST COST, AND OPERATING EXPENSE REQUIRED
TO COMPENSATE FOR HEAT GAIN FROM LIGHTING AT VARIOUS LEVELS OF ILLUMINATION
(DATA BASED ON FACTORS AND ASSUMPTIONS NOTED IN THE TEXT)

	Footcandle Level					
	40	60	80	100	120	140
1. Total refrigeration required to offset heat gain from lighting, tons/10,000 sq ft	11	16.5	22	27.5	33	38.5
2. Refrigeration required to offset heat gain from ballasts, ton/10,000 sq ft	1.86	2.79	3.72	4.65	5.58	6.51
3. Installation (first) cost for equipment for Line 1, \$/10,000 sq ft*	6600	9900	13,200	16,500	19,800	23,100
4. Installation (first) cost for equipment for Line 2, \$/10,000 sq ft*	1116	1674	2232	2790	3348	3906
5. Operating expense for equipment Line 1, \$/10,000 sq ft/year**	330	495	660	825	990	1155
6. Operating expense for equipment Line 2, \$/10,000 sq ft/year**	56	84	112	140	168	296

* Based on \$600/ton

** Based on \$30/ton/year

illumination, the first cost for air conditioning equipment to offset heat from lighting is in the vicinity of \$132,000 for a 100,000 square foot space. The operating cost of this equipment is estimated at \$6600 per year. Furthermore, the portion of these costs attributable to ballast heat is approximately \$22,300 plus \$1120 per year.

If ballasts were housed outside of the air conditioned space as shown in Fig. 3, and the heat gain from these ballasts were removed using ex-

haust fans only (circulating building exhaust air through the space housing the ballasts or just using outside air), the first cost could be reduced by an estimated \$20,000 or more, and the operating expense cut by \$1000 per year. These savings make allowances for the installation of an exhaust system and the operating expenses for the system.

Thus, our first step for reducing air conditioning costs attributable to heat gain from lighting equipment can pay worthwhile dividends.

The next step is somewhat more difficult. The 83 percent of the heat gain represented by the energy given off by lamps cannot be readily collected and removed without blocking out part or all of the light. However, if fixtures were installed in a reasonably tight plenum above the ceiling as shown in Fig. 4, with only lenses or grids coming through, we could ventilate the plenum space above the ceiling using outside air and remove between 50 and 60 percent of the heat generated by the fixtures. This method has been applied successfully on many projects. It is, however, not feasible when surface mounted or suspended fixtures are used, and often can not be used because architectural and economic considerations preclude the availability of sufficient story height. But where physically possible, this method of heat removal is recommended because of its simplicity and effectiveness.

Equipment Design

A third approach to this problem would require the cooperation of the fixture manufacturing industry

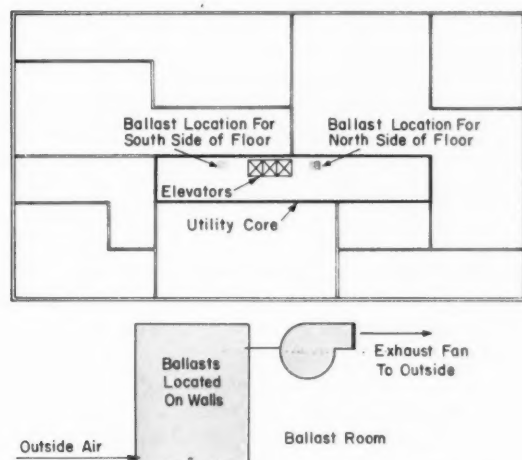


Fig. 3 — Isolating ballasts outside of air conditioned space and providing ventilation cuts the heat load.

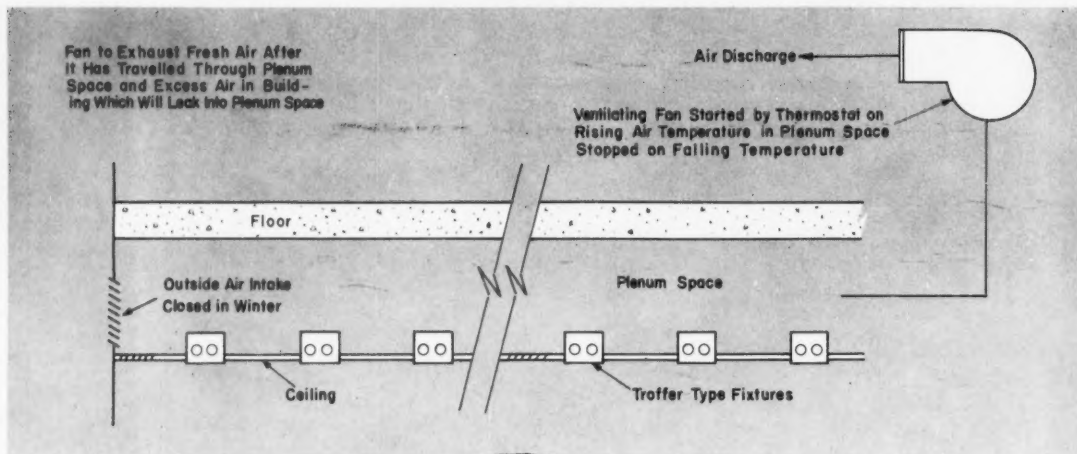


Fig. 4 — Ventilation of plenum space over the fixtures would remove from 50 to 60 percent of the heat generated.

and the consulting engineering profession. Let us assume, for a moment, that our fluorescent fixtures are equipped with integral pipes affixed to the top of the fixtures and that water at 85 F is circulated through these pipes. Let us further assume that the heat exchange between the fixture body and the pipe is reasonably efficient. Then, the temperature in the fixtures could be maintained at approximately 90 F, and between 60 and 80 percent of the heat energy developed by the light sources could be removed so that a nominal 100-watt unit would dissipate only 20 to 40 watts into the air conditioned space. As a by-product we would find that the fixtures would operate more efficiently and require less maintenance.

An office building with 100,000 square feet of conditioned space illuminated at 80 footcandles would require a water circulating system and a cooling tower capable of circulating 360 gpm in order to remove 70 percent of the heat gained from lighting fixtures. The installation cost of this system, including branch piping, is estimated at \$13,000 to \$18,000, and the operating expenses at \$200 per year. The savings are \$92,000 first cost, and \$4630 per year operating expense. Thus, the net savings can be estimated at approximately \$75,000, or \$0.75 per square foot first cost and \$4400 per year, or approximately \$0.044 per year per square foot operating expenses.

In winter, of course, these systems would not be operated, and the heat from the lights would go into the occupied area and help satisfy the heating requirements. A precise analysis would give an actual dollar saving to be credited to the lighting system in the heating season.

While these calculations are based on assumptions that are generally true for office space, the

results pertain equally well to spaces used for other purposes. The problem of the hidden expenses for increased illumination are there, whether we deal with air conditioned office spaces, hospitals, banks, retail stores, recreation centers or industrial facilities. As a matter of fact, retail stores and chain stores recently have introduced lighting levels of 120 to 200 footcandles. This has been found to attract more shoppers, hence the assumption that the resulting sales increase will more than pay for the added initial and operating costs.

However, these establishments pay an enormous price for that portion of their air conditioning equipment which serves no other purpose but to remove the heat introduced by the lighting equipment. At 200 footcandles the air conditioning equipment required to remove the heat from lighting is in the vicinity of five tons per 1000 square feet. Thus, a typical chain food store with 30,000 square feet of floor space and 200 footcandles illumination will require 150 tons of refrigeration to merely compensate for the heat gain from the lighting unless other means are provided to remove this heat. Using the least expensive method of air conditioning (self-contained units), the first cost for these 150 tons of refrigeration capacity is approximately \$70,000, and the operating expense on a 60 hour per week basis is approximately \$6000 per year. This means a first cost of \$2.33 per square foot of floor space, and \$0.20 per square foot per year operating expense.

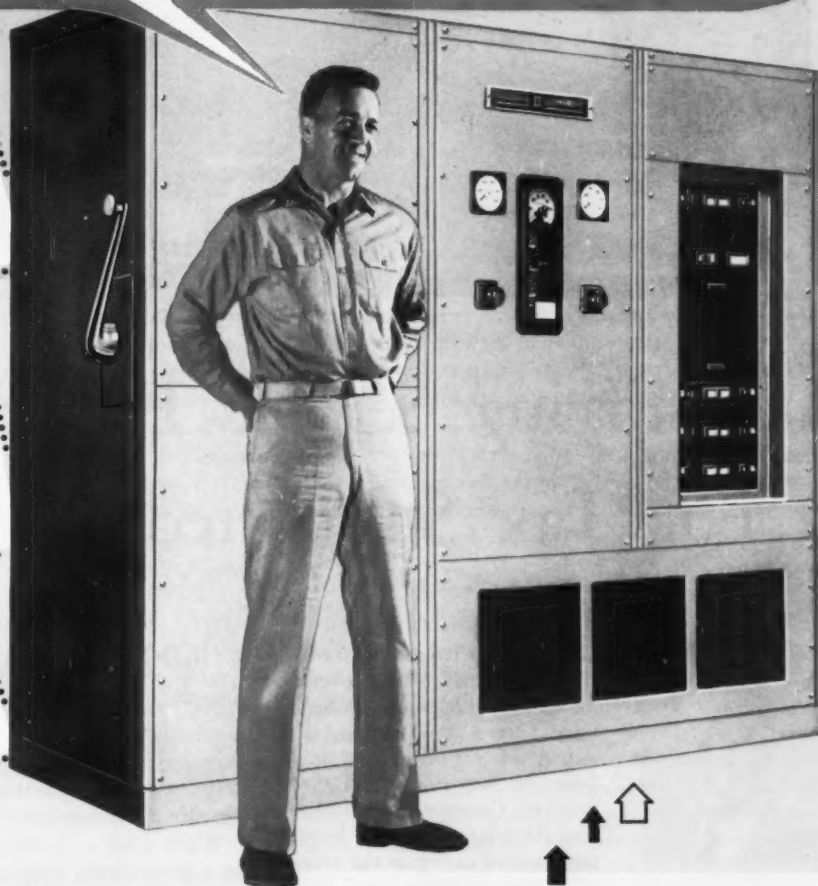
From this analysis, it can be seen that substantial savings can be realized if any one or a combination of the methods previously described are instituted. The figures tell us, in no uncertain terms, that we can and we must reduce the cost of our high standard of vision. ▲▲

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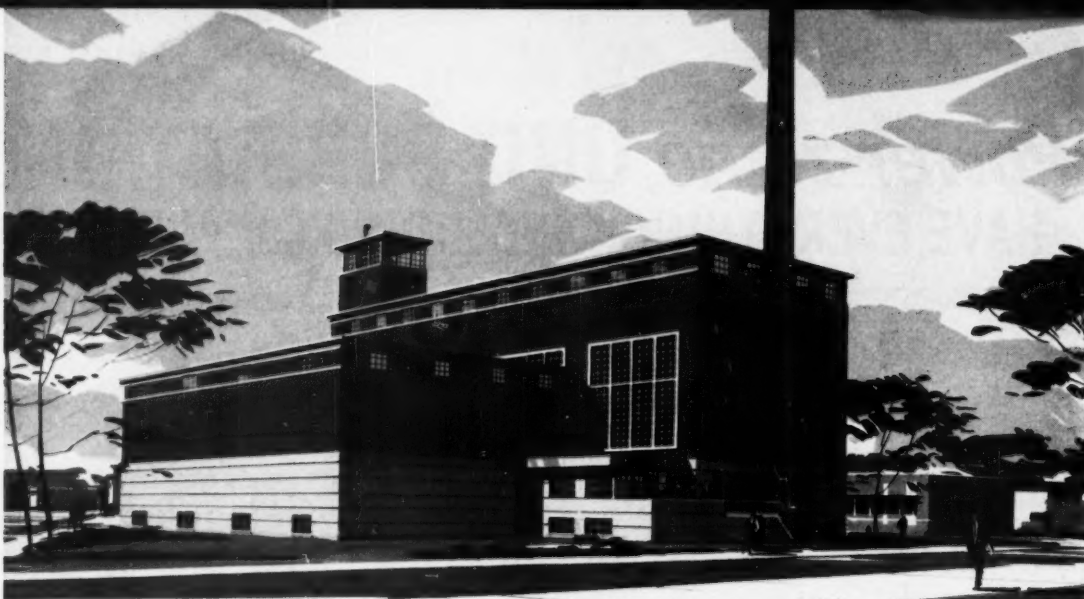
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Gordon W. Neal attended the University of Nebraska where he earned a Bachelor of Science Degree in Mechanical Engineering. For the past five years he has been with the firm of Consoer, Townsend and Associates. He has been particularly active in the area of public facilities, and has

made numerous economic and design studies of institutional power plants and other services. Neal is a registered engineer in Iowa, Illinois, and Nebraska, and is certified by the National Board of Engineering Registration. He is a member of ASME, NSPE, Sigma Tau, and Pi Tau Sigma.

GORDON W. NEAL

Consoer, Townsend and Associates

accounting methods used by the two types of enterprise are somewhat different.

When a tax-supported, nonprofit institution such as a government hospital, a penal institution, or a school finds it necessary to extend its facilities, only two items of cost are ordinarily involved: the original construction cost, and the annual operating and maintenance costs thereafter. There is usually little reason to make any further economic accounting other than for comparative purposes.

Service Facility Projects

There are certain other types of projects undertaken by these institutions, however, in which a more thorough economic appraisal becomes necessary. These projects usually are connected with service facilities — facilities not involved directly in the primary function of the institution. Examples are building heating, electric energy, laundry facilities, and water supply.

Often alternate methods are available for providing these services. There may be a choice between having a service provided by an outside sup-

THE EXISTENCE of a commercial enterprise depends upon its ability to provide a monetary return on the owner's investment. Therefore, it must attempt to account for all costs attendant to its operation, even though some may never reveal themselves as a direct cash outlay. On the other hand, a publicly-owned, nonprofit enterprise by its very nature cannot measure the return on its investment directly in terms of money. As a consequence, the

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plier or by the institution itself. In other instances there may be various choices among different outside sources or among different methods for providing the service within the institution.

When these alternate solutions exist and a comparison based strictly on financial considerations is desired, the problem takes on certain aspects of a business investment. The savings that can be realized by the most economically attractive solution represent a sort of profit to the institution.

When outside suppliers are the only possible sources, a comparison usually is simple. Published quotations can be compared directly, since these ordinarily represent the total cost to the institution. However, when a possible solution involves having the institution provide the service itself, the problem becomes more complicated. With this arrangement it generally is necessary to break the costs (usually on an annual basis) into two major divisions: operating costs and fixed costs.

Operating costs represent those costs directly attributable to the use of a facility. These include labor, supplies, maintenance, and other similar costs that would not be incurred if the facility were not in use. Most operating costs are not too difficult to ascertain. Local prices, cost records of similar projects, and the estimated rate of usage ordinarily provide sufficient data for estimating purposes.

Fixed costs, on the other hand, represent the costs attributable solely to the ownership of a facility. These costs generally will be incurred regardless of whether the facility is ever used. Sometimes it is difficult to estimate these costs accurately because many do not appear as direct recorded expenditures. In addition, the determination of many fixed costs involves long range projections into the distant future.

Because of their somewhat nebulous nature, fixed costs often are estimated by short-cut methods. One practice is to allow an arbitrary percentage of the original construction cost annually. Another is to allow a payout time, based on operating cost savings, which is substantially shorter than the actual expected life of the facility.

While these short-cut methods may result in satisfactory allowances for fixed costs, it is much better to determine as accurately as possible the amount actually represented by each item of these costs. On heavily capitalized projects the annual fixed costs can exceed the operating costs by a considerable margin; this alone is sufficient reason to make accurate determination of fixed costs an important objective.

Items of Fixed Cost

Fixed costs of the discretionary projects undertaken by the various tax-supported institutions generally

fall into one of the following four subdivisions.

- ¶ Depreciation
- ¶ Interest
- ¶ Tax allowance
- ¶ Insurance and contingencies

Depreciation can be defined as the amount set aside annually to replace a facility at the end of its useful life. It also can be considered as the portion of the original cost that is chargeable to each year of useful life.

There are several methods of allowing for depreciation including straight-line, percentage-of-present-value, sinking-fund, and sum-of-the-digits. Each method possesses features that make it suitable for a particular type of cost analysis. Furthermore, several factors enter into the determination of useful life. Wear and tear, physical decay, neglect, inadequacy, and obsolescence all play a part in the life of an item of equipment.

Most institutions are relatively stable and permanent. Therefore it generally is possible to use a depreciation allowance based on the straight-line method. Useful life may be estimated from projects of similar type and usage. Estimated annual depreciation cost can be calculated by dividing the initial construction cost by the predicted life in years.

Determining Interest Rates

Interest is the amount paid for the use of the funds that finance the construction of the project. Interest is a definite item of fixed costs even though the money may not be actually borrowed from others. One way of viewing interest is to consider it as the minimum payment which the institution expects from a discretionary project in return for giving up funds that could be put to use in the primary functions of the institution. The initial cost of a project cannot be justified unless the return is higher than that which could be realized at similar risk elsewhere — either from another worthwhile project or from an interest bearing fund.

In determining the interest rate that should be used, several methods are available. If the taxing body furnishing the funds for the institution is paying interest on borrowed money, the rate being paid is a useful guide. Interest rates on obligations of similarly situated enterprises may be helpful. In applying interest rates it is usually better to use an average figure representative of a period of several years rather than to use the current rate, unless the undertaking is of short-term significance.

It should be pointed out that interest also accrues to the benefit of a project when savings are realized over and above the operating and fixed costs. These savings are returned to the institution and accumulate interest. It is possible to deduct these credits from the interest on the initial cost and

treat both items as a single unit; however, treating them separately results in a clearer picture of estimated costs.

Ordinarily the most satisfactory method of computing average annual interest costs is to assume that the project is amortized by means of equal annual payments made over its life. Amortization tables will supply the total annual payment required to do this. Subtracting the average annual principal (represented by the annual depreciation charge when the straight-line method is used) from this payment gives average annual interest cost.

Interest credits on savings realized over and above operating and fixed costs can be computed by the use of annuity tables. These tables show the total amount accumulated by the end of the estimated life of the facility if the savings are invested at the end of each year and if the interest is compounded annually. Subtracting the total amount of savings actually put into the fund and dividing by the years of estimated life will result in the annual interest to be credited to savings.

Tax Allowance

Tax-supported institutions, by their very nature, are not required to pay taxes on property. They are, however, financed by taxes. This has a bearing on whether a service should be provided by the institution itself or by an outside supplier.

If the institution does provide the service, a certain amount of private investment in equivalent facilities will be lost for tax purposes. And when a payment is made to a private supplier, some of the money finds its way back to the institution via tax channels. If a direct deduction in purchase price is made to the institution, as sometimes is done with sales taxes, that part of tax allowance naturally is eliminated.

The tax allowance portion of fixed costs applies only where there is a choice as to whether a service should be provided by the institution or by an outside supplier. It does not apply where the institution itself is the only possible supplier.

In determining the amount to allow for this diminution of tax revenue, a number of factors must be borne in mind. Because of larger production equipment and a greater diversity in demand, the private supplier is likely to need a smaller investment in facilities to handle the institution's load than the institution itself would need. Furthermore, tax collection expenses are not incurred. When these factors are considered, the equivalent taxable property being displaced may represent an amount that is less than half the investment contemplated by the institution.

A convenient method of calculating the allowance applicable to property tax is to determine the

ratio of the value of the private property displaced to the prospective initial investment that would be required by the institution. This ratio then may be applied to the tax rate on the property of the private supplier. The only taxes applicable are those payable to the taxing body, including its subsidiaries, which finances the institution. This adjusted tax rate then may be applied to the depreciated value of the project. The applicable taxes are likely to flatten out instead of continually dropping all the way to zero as the end of the life of the facility approaches. For this reason it is a good idea to use a constant annual tax allowance after a certain period has elapsed. The average annual tax allowance is determined by dividing the total tax allowance charged during the life of the facility by the number of years of estimated life.

Insurance and Contingencies

This item of fixed cost represents the amount allocated to cover the risk of catastrophe or major repairs. When a risk is assumed by an underwriter, the charge appears as a definite recorded expense. When the owner is self-insured, he assumes this burden of risk himself, and the charge is still real even though it is not apparent.

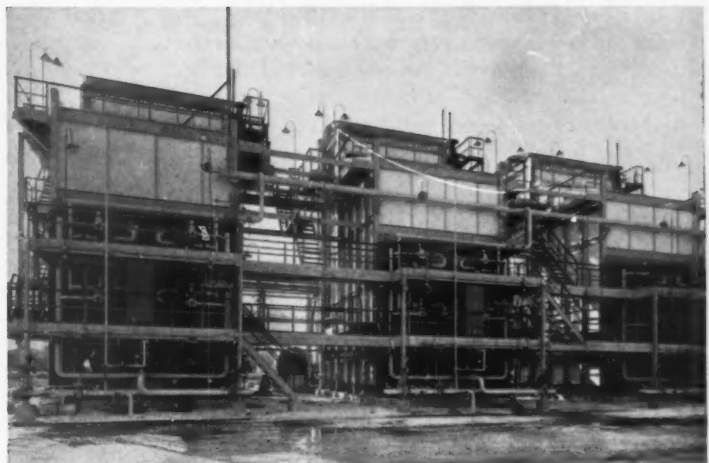
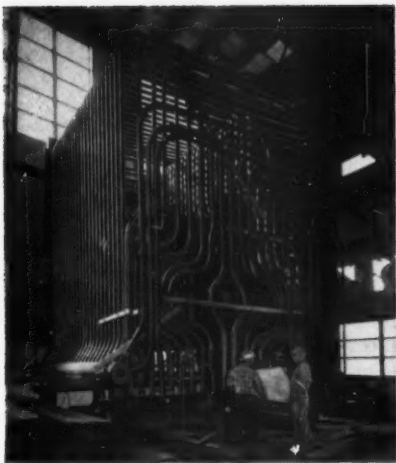
The amount chargeable to this item can be calculated by allowing a constant percentage of original cost per year. As the value of the facility decreases with age, the risk of financial loss from catastrophe decreases somewhat proportionately. Offsetting this decrease is the increasing likelihood of major repairs as the facility becomes older.

An Example

Each comparison must be judged on its individual merits. Careful scrutiny should be given to the applicability and amount of each item of fixed costs; however, the relatively high proportion of total costs often represented by these can make this scrutiny well worthwhile.

A field in which a comparison often can be made between an outside supplier and a source within the institution is the generation of electric energy. Institutions quite often find it imperative to provide steam for building heating and process uses. The steam can be produced at pressures and temperatures higher than required for these uses and then reduced to the proper pressure and temperature by passing it through noncondensing or extraction turbines driving electric generators. With a favorable balance between steam demand and electric demand it is possible to achieve extremely high thermal efficiencies with this arrangement, which will be reflected in lower over-all costs.

An example of a comparison of this type, where a state institution is faced with the necessity of



AT LEFT: Installing a 60,000 lbs/hr unit in a brewery

ABOVE: A battery of 125,000 lbs/hr units in a chemical plant

CUSTOM *Steam*

Vogt engineering advances can save you money if you have a steam generating problem. Custom-built installations shown, are engineered to assure efficient, dependable steam generation for power, process and heating. Our engineering staff is available to give effective help in the solution of steam generating problems peculiar to a wide variety of operating conditions. Address Dept. 24A-BCE.

GENERATORS

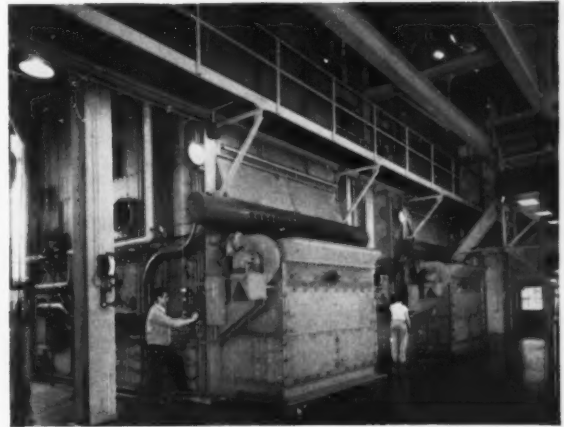
by **Vogt**

HENRY VOGT MACHINE CO.
LOUISVILLE, KENTUCKY

SALES OFFICES: New York, Chicago, Cleveland, Dallas,
Canton, N. J., St. Louis, Charleston, W. Va., Cincinnati



This 400,000 lbs/hr unit is installed in a leading petroleum refinery



Three 40,000 lbs/hr units serve a medical center

building a plant to provide steam for heating and process, is provided in Table 1. The question has arisen as to whether a combination heating-electric generation plant would be economically feasible. Two cases, differing only in the cost of purchased energy, are considered, based on these conditions:

¶ Cost of purchased energy:

Case I — 10.5 mills per kwh

Case II — 11.5 mills per kwh

¶ Maximum electric demand: 3500 kw (use an installation consisting of three, 2000-kw turbogenerators — one acting as standby)

¶ Annual electric consumption: 15,300,000 kwh

¶ Extra plant construction cost: \$1,500,000 (over and above cost of straight heating plant)

¶ Plant life: 35 years

¶ Interest rate: 3% per annum

¶ Annual interest on savings: From annuity tables,

the amount accumulated after 35 years by a payment of \$1.00 at the end of each year at 3% interest compounded annually is \$60.462. Thus the average annual interest on savings per \$1000 equals:

$$1000 \times (60.462 - 35) \div 35 = \$727$$

¶ Annual tax allowance: 1% of the depreciated plant value (remains constant after the first 15 years of the plant life)

¶ Annual insurance and contingencies cost: 0.5% of original construction cost

¶ Plant operating costs: 5.0 mills per kwh

The results of the calculations for these conditions, as summarized in Table 1, demonstrate the necessity for an accurate estimate of fixed costs. A difference of about ½ mill per kwh, or 10 percent of the total fixed charges, could spell the difference between a financially feasible operation and one that would be economically unwise. ▲▲

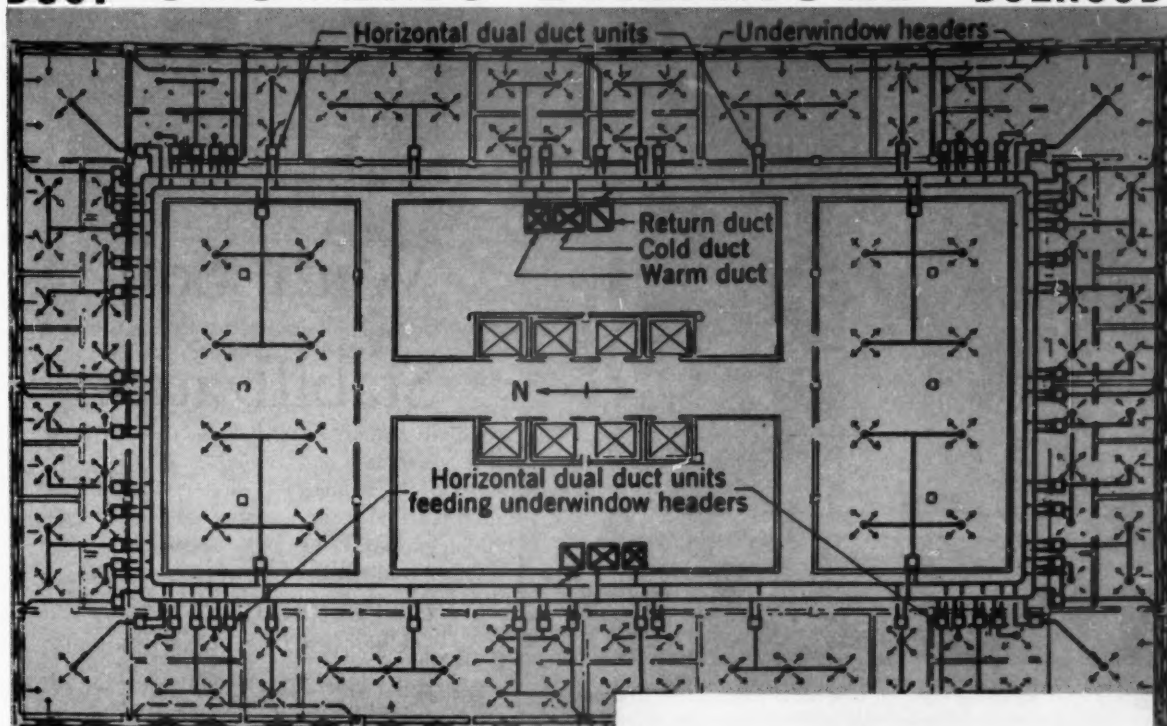
TABLE 1
COST CALCULATIONS & SUMMARY FOR GENERATED ENERGY

Fixed Costs	\$/year	Mills/kwh
Annual depreciation cost: $\$1,500,000 \div 35 \text{ year} =$	\$ 42,900	2.8
Annual interest cost: (From amortization table for 35 years and 3% interest rate)		
Total annual payment for \$1000 =	\$46.539	
Less annual principal per \$1000 = $\$1000 \div 35 =$	28.571	
Net annual interest per \$1000 =	\$17.968	
Annual interest cost = $1500 \times 17.968 =$	\$ 27,000	1.8
Annual tax allowance:		
Average annual allowance for first 15 years of plant life = $0.0125 \times 1,500,000 \times \frac{1}{2} [1 + (35 - 15) \div 35] =$	\$14,732	
Average annual allowance after 15 years = $0.0125 \times 1,500,000 \times 20 \div 35 =$	\$10,714	
Average annual allowance during life of plant = $(15 \times 14,732 + 20 \times 10,714) \div 35 =$	\$ 12,400	0.8
Annual insurance and contingencies: $1,500,000 \times 0.005 =$	\$ 7,500	0.5
Total Fixed Costs	\$ 89,800	5.9
Operating Costs = $(.005 \times 15,300,000) =$	\$ 76,500	5.0
Total Cost of Generated Energy	\$166,300	10.9

COST COMPARISONS

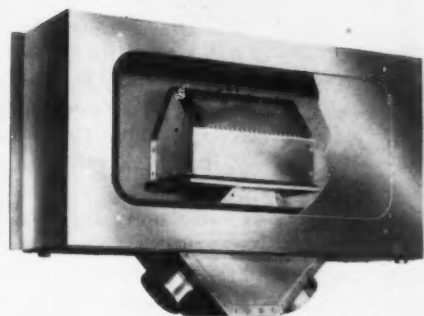
Case I			Case II		
	\$/year	Mills/kwh		\$/year	Mills/kwh
Cost of generated energy	166,300	10.9	Cost of generated energy	166,300	10.9
Cost of purchased energy	160,600	10.5	Cost of purchased energy	175,900	11.5
Excess cost for generated	5,700	0.4	Excess cost for purchased	9,400	0.6
Interest on excess 5.7×727	4,100	0.3	Interest on excess 9.6×727	6,800	0.5
Gross Savings for Purchased	9,800	0.7	Gross Savings for Generated	16,200	1.1

DUAL DUCT SYSTEMS BALANCED BY BUENSOD



Shown above is a typical office building Dual Duct layout. It shows a floor plan for known-occupancy requirements in either a new or modernized old building. This economical, 100% all-air system is zoned to provide selective temperature control for each enclosure. Lack of under-window space is overcome by installation of overhead mixing units feeding air to slim distributing headers under the sill of the windows. This takes care of the skin effect of the building.

Illustrated: Buensod Type H unit designed for overhead installation, generally above hung ceilings. The unit may be connected to any standard ceiling diffuser or grille. Cutaway shows self-contained volume regulator in place.



Buensod Dual Duct air mixing units are the flexible, economical answer to your floor-by-floor air distribution problems. The series of Buensod diagram advertisements (of which this one is the third) illustrates this fact. The first advertisement showed a normal, all-air system for a commercial office building. Anticipated changes in space arrangement required much flexibility. The second advertisement presented a structure with the air system supplemented by radiation. In all three layouts the space

arrangement and conditioning requirements are identical.

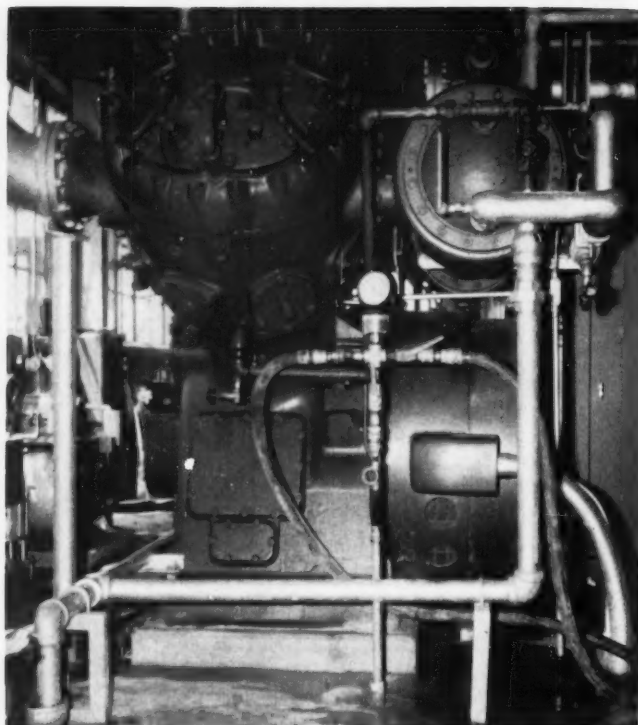
And in this third advertisement, the plan above shows a 100% all-air Dual Duct system for the floor plan where less flexibility—fewer changes in zones—are expected.

Dual Duct versatility is further enhanced by Buensod's *exclusive* pre-balancing of units at the factory. When so ordered, they will immediately deliver the specified air volume upon installation.

BUENSOD dual-duct

BUENSOD-STACEY
INCORPORATED

Buensod-Stacey, Inc., 45 West 18 Street, New York 11, New York



Y-type air compressor on reinforced concrete foundation vibrated with an amplitude sufficient to cause damage.

Controlling Vibration With Soil Stabilization

J. F. WISS
Consulting Engineer

J. A. ZURBRIGEN
Chemject Div. of Caisson Corp.

J. P. GNAEDINGER
Soil Testing Services, Inc.

EXCESSIVE VIBRATION of heavy machine foundations often has strained engineer-client relationships. This condition usually triggers a series of inferences that result in hot debate as to which is at fault, the machine or the foundation. The determination of just who is guilty is important from a financial and perhaps even an engineering point of view, but laying the blame has no effect on the machinery. It continues to vibrate without regard to the innocence or guilt of manufacturer or foundation engineer. The really important question is, "How can the foundation vibration be reduced?"

A machine foundation supported on soil is a mass-spring system with its own characteristic natural frequencies. When displaced, it can oscillate in any of six modes depending upon the direction and location of the applied force. Three of these modes are straight-line oscillations (vertical, longitudinal, and transverse). The other three modes are rotational — the machine foundation rocks about the different axes. If any of these natural frequencies are close to the frequency of the disturbing force, a resonant or near resonant condition exists. This magnifies the amount of vibration produced by the machine and may result in objectionable vibration.

If the frequency of the disturbing force can be changed by increasing or decreasing the speed of the machine, the vibration of the foundation may be reduced to acceptable levels. If the speed of the machine cannot be changed, it is necessary to change the natural frequency of the objectionable mode by altering the mass, the distribution of the mass, or the elastic properties of the soil.

The injection of chemicals into relatively pervious soils causes the soil to become stiffer, and this increases all six natural frequencies of the foundation. This method is effective in reducing the vibration when the disturbing frequency is at or near the natural frequency of the objectionable mode. This is illustrated in Fig. 1 which represents the magnification factor curve found in most texts on vibration.

It can be seen that increasing the natural frequency reduces the ratio plotted on the abscissa. Therefore, when the natural frequency is increased a point on the curve moves to the left. If the original operation of a machine is represented as Point A or B, it is apparent that chemical injection of the soil will result in a lesser magnification factor and reduced vibration as these points are moved along the curve to the left. On the other hand, if

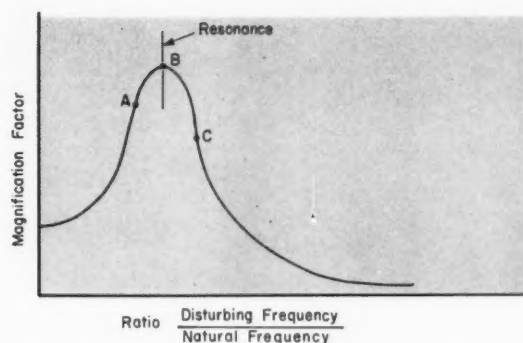


Fig. 1—Magnification factor curve shows the affect of changing frequency on magnitude of vibration.

point C is moved slightly to the left, the magnification factor is increased, and foundation vibration will be greater than if chemical injection had not been done. This condition must be dealt with carefully to make sure that the change in natural frequency brought about by chemical injection moves point C far enough to slide it on down the curve at the left rather than leave it high up on the peak. Proper laboratory tests on treated samples permit the determination of the relative effectiveness of this method.

It also is necessary to review the probable effect of the treatment on the natural frequency in the other modes. Treatment that reduces vibration in one mode may increase the vibration in another

by bringing its natural frequency into resonance with the disturbing frequency. The need for a complete vibration analysis prior to the application of a chemical injection technique is mandatory.

Compressor Foundation

A recent project illustrates the successful application of the soil injection method.

A Y-type air compressor (see photograph) rated at 225 brake horsepower was installed on a 12' x 7' x 2'-6" reinforced concrete slab at the General Electric Company plant, in Lynchburg, Virginia. It was found to vibrate with objectionable amplitude as a result of movements produced by the unbalanced secondary disturbing forces of the compressor. The amplitude of these vibrations was considered sufficient to cause crystallization of piping joints and a reduction in the life of bearings in the compressor. In addition, the vibrations were being transmitted through the soil to adjacent portions of the boiler room, causing considerable annoyance and minor damage.

Vibration measurements indicated that the objectionable vibration was in a rotational mode about an axis parallel to and 6'-3" below the compressor crankshaft. The natural frequency in this mode was within 8 percent of the disturbing frequency (Fig. 2). The translation movements and the movements in the other rotational modes were found to be insignificant.

As a result of the vibration analysis, stabilization was proposed beneath the ends of the foundation

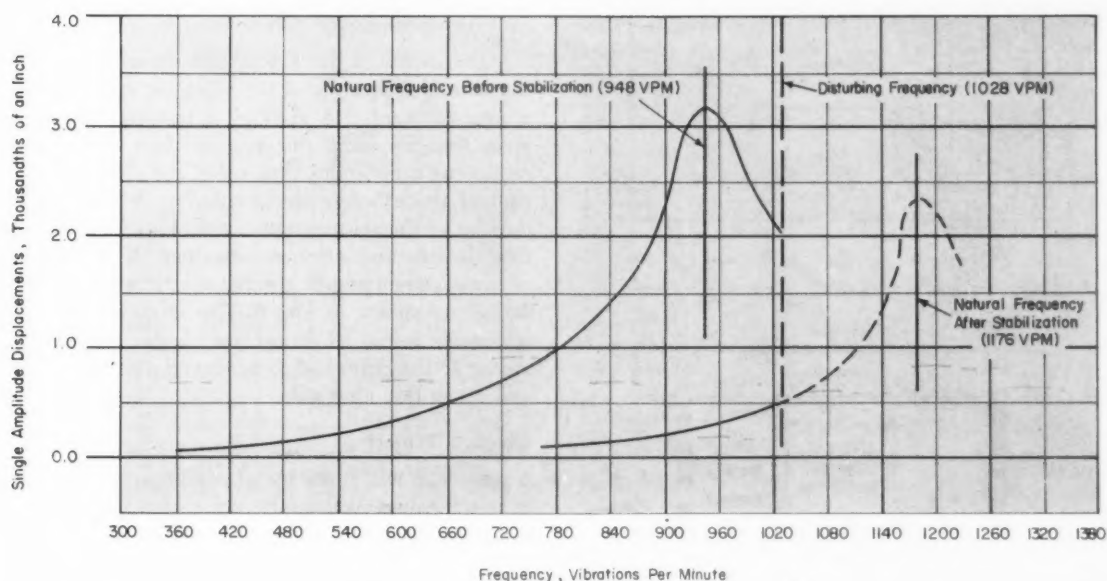


Fig. 2—Actual measurements show original and final natural frequency compared to compressor's disturbing frequency.

slab to a maximum depth of 7'-6". Termination of the stabilization at this elevation was based on the assumption that the effect of the vibratory loading would be negligible at this depth and any attempt to change the natural frequency of the vibrating system by stabilization beyond this point would be uneconomical. Fig. 3 provides a plan and profile of the theoretical limits of the designed soil stabilization program.

The field operation involved the removal of 4" cores from the slab at the locations indicated in Fig. 3 and the augering of 4" holes to a depth of 7'-6" below the bottom of the slab. Perforated tubes, 2" outside diameter with rubber sleeves covering the perforations, then were placed in these holes and grouted in place with a neat cement grout. The grout was allowed to harden for approximately 12 hours.

Before the injection of any chemical grout, a cement-clay grout was forced into the interface between the base of the slab and the soil so that the contact between the slab and the stabilized soil would be complete. Following this operation, a polymerizing vinyl type plastic in water solution was injected into the soil (micaceous sandy silt), under pressures up to 45 psi, as shown in Fig. 4 at the various stages indicated in Fig. 3. Sufficient quantities of chemical grout were injected to produce a stabilized volume of the design dimensions.

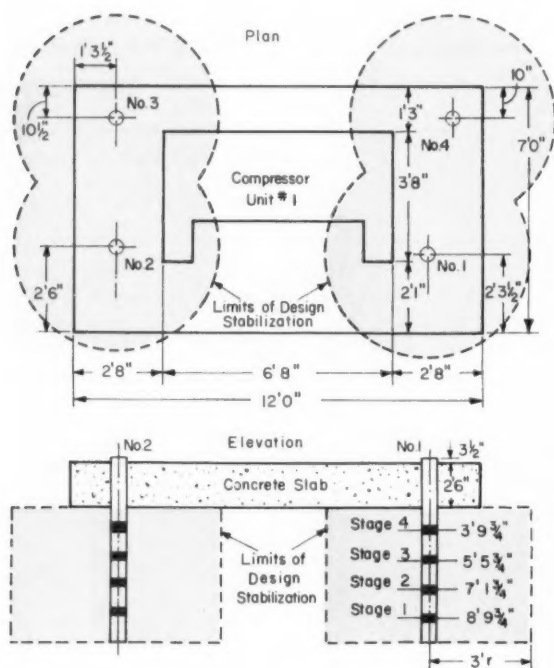


Fig. 3—Plan and profile views show limits of proposed soil stabilization under compressor foundation.

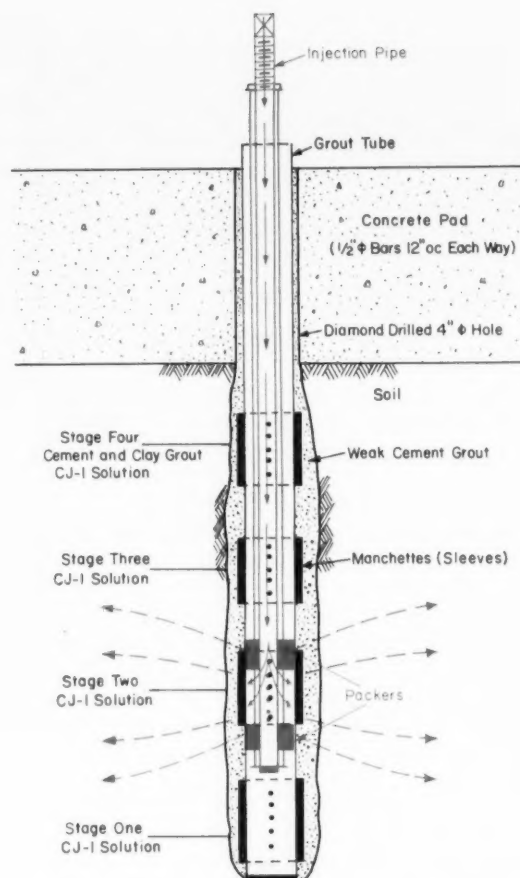


Fig. 4—Pressures up to 45 psi were used to inject polymerizing vinyl type plastic in water solution.

Stabilization of the soil in this manner changed the natural frequency of the vibrating system from a near-resonant 948 vpm to a nonresonant 1176 vpm, thus reducing the magnification factor and producing amplitudes that were less than 40 percent of those before treatment. Fig. 5 is a reproduction of the seismographic traces on the foundation, before and after stabilization. A tabulation of the vibration amplitudes before and after stabilization are shown in Fig. 6. This is an example in which the initial condition was similar to point C in Fig. 1. The point had to be moved over the hump and down the other side.

Chicago Project

A project in which the initial condition was similar to point A was successfully completed for the National Cylinder Gas Company, in Chicago. In this project 7.5' of saturated medium dense fine sand beneath a 27,000-lb "Expander" foundation (130-sq ft base area) was chemically stabilized after

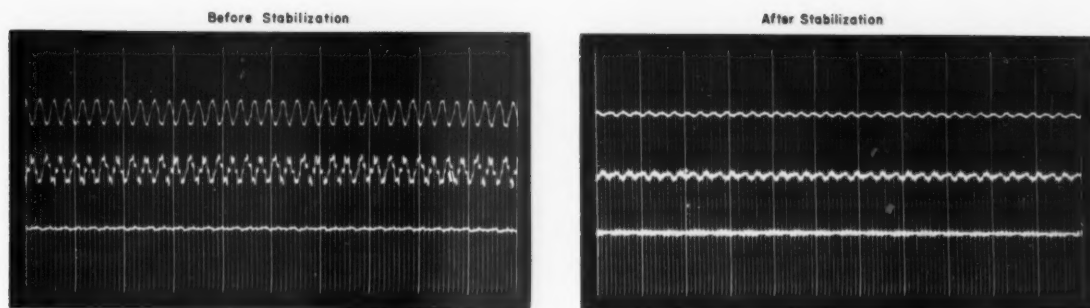


Fig. 5—Seismographic traces before and after stabilization of soil clearly indicate the improved condition.

appropriate vibration analysis and laboratory tests. The procedure followed in performing the soil stabilization in this instance was identical to that used for the Lynchburg project. The natural frequency of the foundation (in a rocking mode) was increased from a near resonant 300 vpm to a nonresonant 402 vpm, thus moving point A to the left along the curve and causing a corresponding reduction in amplitude of foundation vibration.

Both of these projects show that the stabilization of limited volumes of soil beneath vibrating machine foundations produces significant changes in the physical properties of the soil, which materially affect the natural frequency of the vibrating system. This results in a marked reduction in the amplitude of the vibrations produced by the disturbing forces when their frequency is at or near resonance with a natural frequency of the foundation.

Procedures

In order to determine the applicability of this method to a foundation vibration problem:

¶ Determine the objectionable mode of the vibration by actual measurement. The human senses can be deceived.

¶ Determine by measurement the relationship of the disturbing frequency to the natural frequency in the significant modes.

¶ Establish by laboratory tests on treated samples the relative changes in elastic properties of the soil that can be expected to occur as a result of chemical injection.

¶ Determine the change in natural frequency that will result and the effect these changes will have on the objectionable mode.

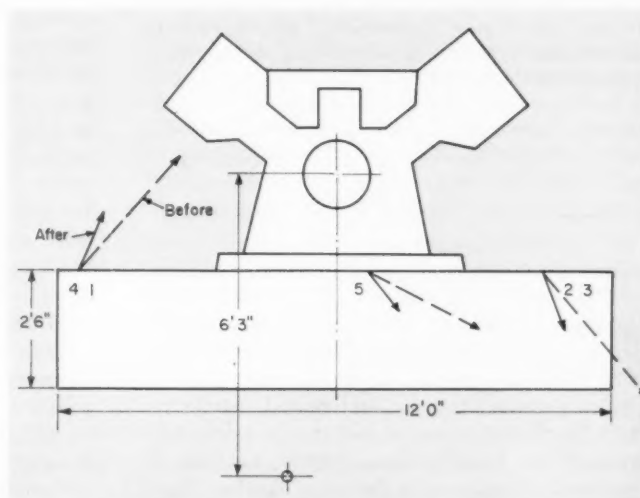
¶ Review the effect of these changes in the elastic properties of the soil on the other vibration modes of the foundation.

The application of this method by trial and error techniques is dangerous, since there is no way to undo the solidification of the soil if the conditions are aggravated rather than improved. The procedure outlined is a vital preliminary to successful application of this technique. ▲▲

Position	Before Treatment			After Treatment		
	L	V	T	L	V	T
1	2.6	2.8	0.3	0.4	1.0	0.5
2	2.5	2.7	0.8	0.4	1.2	0.8
3	2.3	2.9	0.9	0.5	1.5	0.6
4	2.3	2.6	1.6	0.5	1.4	0.5
5	2.5	1.3	0.9	0.5	0.6	0.5

Note: Measurements in Thousandths of an Inch

Fig. 6—Tabulation of vibration amplitudes at five points, before and after completion of soil stabilization program.



How to set up a Master Specification

HUGH C. CARTER

Hugh Carter Engineering Company



Hugh C. Carter graduated from California Institute of Technology, with a B.S. degree in Mechanical Engineering. Before establishing his own firm in 1957 he was employed in various engineering capacities with an engineering-contracting firm, the State of California, and an architectural firm. He is the author of a textbook on mechanical estimating and has long been interested in the problem of improving and simplifying the writing of engineering specifications. Carter is a member of the Consulting Engineers Association of California, the American Society of Heating Refrigerating and Air Conditioning Engineers, the American Society of Mechanical Engineers, and the California Society of Professional Engineers. He is a registered mechanical engineer in California and Nevada.

EVERY ENGINEERING and architectural office has a constant need for improving and simplifying the writing of specifications. The very nature of specifications requires their preparation and completion during the closing phases of design when deadlines loom and time is short. Consequently, a multitude of systems, schemes, and elaborate routines have

CE exclusive

DIVISION _____ HEATING AND AIR CONDITIONING

ARTICLE I - SPECIAL NOTE

The Contract and Division I - GENERAL PROVISIONS - of these specifications govern all parts of the work and are parts of and apply in full force to these specifications for HEATING AND AIR CONDITIONING. The Contractor shall refer thereto as forming integral parts of his Contract.

ARTICLE II - SCOPE OF WORK

DESCRIPTION

The installation of hot water boiler, water chillers, cooling tower, pumps, piping, multizone units, with zone control to provide a complete automatic heating and air conditioning installation.

WORK INCLUDED

All material, labor, and equipment required for a complete heating and air conditioning installation in accordance with the drawings and specifications, together with items reasonably inferred and necessary to good practice. The following list is not necessarily a complete list:

1. Multizone package unit with fans, hot water and chilled water coils, mixing dampers, and vibration isolators.
2. Exhaust fans, plenums, ducts, and canvas connections.
3. Ceiling diffusers, stripline diffusers, and wall registers and grilles.
4. Duct insulation, acoustical lining, piping insulation.
5. Water chillers with step control, pump and piping.

Master specification sheet is pulled from stock and is ready for marking with special notations, alterations, and deletions for a specific engineering job.

been developed by various offices to short cut this important but tedious job.

Philosophy of the Master

In any discussion of master specifications, it soon becomes evident that there are many consulting engineers who feel that master specifications encourage routine work, perhaps resulting in a tendency to select materials or equipment listed in the master without giving full consideration to new products or special requirements of a particular project. We too have found that it is not desirable to set up a system from which we can routinely select the same kind of materials and equipment for every job. We know that no new job is like any other job. For each and every project there is always the problem of careful selection of the right equipment based on sound professional judgment of what is currently available.

We prefer a base specification that lists at least three manufacturers by name. We feel that this allows a more complete design by the engineer and architect of equipment rooms, general piping arrangements, and other details. It results in more competitive bidding on a common basis — a direct

SECTION 88
DIVISION

HEATING AND AIR CONDITIONING

ARTICLE I - SPECIAL NOTE

The Contract and Division 1 - GENERAL PROVISIONS of these specifications govern all parts of the work and are parts of and apply in full force to these specifications for HEATING AND AIR CONDITIONING. The Contractor shall refer thereto as forming integral parts of his Contract.

ARTICLE II - SCOPE OF WORK

DESCRIPTION

THE INSTALLATION OF DIRECT FIRED AIR CONDITIONING UNITS, hot water boiler, water chillers, cooling tower, pumps, piping, multizone units, with zone control to provide a complete automatic heating and air conditioning installation.

WORK INCLUDED

All material, labor, and equipment required for a complete heating and air conditioning installation in accordance with the drawings and specifications, together with items reasonably inferred and necessary to good practice. The following list is not necessarily a complete list:

1. Multizone package unit with fans, hot water and chilled water, heat exchanger, condenser, water pumps and piping, coils, mixing dampers, and vibration isolators.
2. Exhaust fans, plenums, ducts, and canvas connections.
3. Ceiling diffusers, strip-line diffusers, and wall registers and grilles.
4. Duct insulation, acoustical lining, piping insulation.
5. Electric reheat duct strip heaters.
5. Water chillers with step control, pump and piping.

New information is hand lettered between lines of master specification sheet to tailor it to the special conditions encountered on that particular project.

SECTION 88

HEATING AND AIR CONDITIONING

ARTICLE I - SPECIAL NOTE

The Contract and General Conditions of these specifications govern all parts of the work and are parts of and apply in full force to these specifications for HEATING AND AIR CONDITIONING. The Contractor shall refer thereto as forming integral parts of his Contract.

ARTICLE II - SCOPE OF WORK

DESCRIPTION

The installation of direct fired air conditioning units, cooling towers, pumps, piping, with zone control to provide a complete automatic heating and air conditioning installation.

WORK INCLUDED

All material, labor, and equipment required for a complete heating and air conditioning installation in accordance with the drawings and specifications, together with items reasonably inferred and necessary to good practice. The following list is not necessarily a complete list:

1. Direct gas fired air conditioning units with fans, heat exchanger, condenser, water pumps and piping, and vibration isolators.
2. Exhaust fans, plenums, ducts, and canvas connections.
3. Ceiling diffusers, and wall registers and grilles.
4. Duct insulation, acoustical lining, piping insulation.
5. Electric reheat duct strip heaters.

Actual specification sheet for a given job appears in this form after approval by principal of firm and final typing and reproduction in desired quantity.

benefit to the owner. Any substitutions suggested by contractors can be reviewed prior to bid date, and those approved can be listed in an addendum circulated prior to that date. Thus, all contractors will have an opportunity to bid on the same basis.

Developing the Master

Initial preparation of a master specification is too big a job for one man unless he can devote full time to it for more than a month. It is better to analyze specifications with the idea of gradually developing a master. A good approach is to write your next large specification so that some portions can be used to start the master.

This is a job that must be handled by a principal in the firm, since a specification, and eventually the master, sets the tone, attitude, standard, and policy of an office. We feel that the best way to check work, retain standards, meet responsibility to clients and maintain a close knowledge of projects, is for a principal to write the specifications on each job personally. This apparently is true nationally, as indicated in the recent report from the Committee of One-Hundred on Specifications (CONSULTING ENGINEER, August 1959).

Prior to developing our master we wrote separately each specification for each job. Frequently, portions of old specifications were incorporated into the new job either by cutting and pasting or by hand copying. As specifications were completed they were cut apart and filed in a three-ring binder by subject. This was some help; however, it seemed as though the paragraphs on file never were quite right and always required considerable modification. There was a good deal of time-consuming hand copying.

We decided to organize the information on printed forms, double-spaced for use as work sheets, to which modifications could be made readily without tedious recopying. This was the break-through. We now had a working tool which could be hand tailored and extensively modified, rewritten, or added to, and yet it allowed a certain paragraph or even a phrase to be incorporated in a job without hand copying.

While the first edition of the master was still at the printer's, we found that certain paragraphs should be revised and other paragraphs should be added, so we had an early indication of the dynamic nature of consulting work, of the basic dif-

ferences in each job, and of the necessity of keeping the master up to date.

The preparation of a master specification is not like other jobs, with a beginning and an end. Corrections, revisions, and deletions must be fed in continuously. Each week there are three or four changes to the master. Mostly these changes are minor and include model number revisions; incorporation of new equipment; refinement, improvement, and discontinuation of a line. About once a month we may have a major change and about every six months a new master is prepared and brought up to date.

During the time between new editions, small changes are transcribed by secretaries into the copies of masters about to be used for a project. Large changes are picked up by retyping various pages and ozalid printing small numbers of the revised pages. New material also can be typed and issued as an addendum.

It should be noted that we keep up to date on materials in several ways. Among them is our practice of reading all the major architectural and engineering magazines each month. This responsibility is divided among the office personnel so that we can cover the field without a burden on any one individual, and it produces effective results. For example, some time ago we were looking for an improved design of drinking fountain. As soon as one appeared in advertising material, we requested literature from the manufacturer so we could investigate the engineering aspects and construction of the equipment. After the investigation indicated the equipment was suitable and well designed, we incorporated it into our standards and since have specified it on several jobs.

Use of the Master

When using a master, specifications are written by deletion. Starting with a complete master, our first section is Special Conditions, which relates the mechanical section to the general or special conditions of the total specifications. Three slightly different paragraphs have been found to meet the requirements of our architect's and all are included in the master. The particular paragraphs that are not required are deleted.

Article II is Scope of Work and includes paragraphs describing work included and work not included. This section requires considerable addition and deletion. Methods of correcting and adding to the master are easily established, and this section can be developed gradually as time is available to devote to it.

Article III deals with Materials, and this is the heart of the job. Grouping manufactured items makes it easier for the contractor to bid the job,

easier to review shop submittals, and easier to administer the contract. Within this article, items are grouped with an eye to the trades installing them as well as their relationship to the total system. For instance, all wet heat items are listed in consecutive order so that this portion of the heating contract can be separated for a subcontractor if the mechanical prime contractor is principally a sheet metal contractor. Wet heat items include boilers, convectors, unit heaters, unit ventilators, pumps, piping, valves, and fittings. Similarly, the ducts, diffusers, and air handling equipment are grouped — as are all other equipment items.

The materials master is quite comprehensive, and many pages are used over and over without change. On a small job, many pages are deleted and a few may be added. As new classes of work are developed, new paragraphs are added to the master. Furthermore, during the job of reading, revising, and deleting, the master serves as an excellent check list.

The last article in the master deals with Workmanship. This section required the longest time in preparation, but it has been found to require the least change. Along with the description of methods to be used, such as making pipe joints and applying insulation, all of the general paragraphs are included on workmanship, including coordination of the trades, inspections, tests, guarantees, permits, and similar items.

Government Specifications

Some agencies of the Federal and state governments and some municipalities have adopted standard specifications, and these standards must be used. However, even on these government jobs the master is quite useful as a check list of items, and as an aid in filling in sections not covered in the standards.

Limitations and Advantages

The master specification represents a very large expenditure in time. But despite the effort and thought put into the master it still will not fit all jobs. However, on most projects the master specification is a great timesaver. It will result in greater accuracy and clarity as individual sections are refined and re-refined. The completeness of the scope makes it next to impossible for the consultant to omit items. It gives a uniformity and continuity to all the work of an office. This is helpful to all those who use the specifications in bidding, construction, and administration of the contract. On a page by page basis the work of perfecting a specification becomes manageable, particularly when refinements are made daily or weekly as they arise, rather than allowing them to accumulate. ▲▲

ONE OF A SERIES: ASCO Complete Emergency Control Systems put Standby Power in action FAST

Separate make and break contacts insure absolutely clean current carrying contacts at all times.

ASCO Automatic Transfer Switches transfer load in $\frac{1}{30}$ to $\frac{1}{6}$ of a second

When a sustained outage is detected, a contact on the ASCO Automatic Transfer Switch closes in $\frac{1}{50}$ th of a second. When standby power source attains proper voltage and frequency, the switch transfers the load to the electric plant. *Time of transfer— $\frac{1}{30}$ th to $\frac{1}{6}$ th of a second—up to 30 times faster than competitive switches!* This speed reflects the extra engineering quality built into every ASCO Transfer Switch. For example, rotating weight design locks contacts in position. They cannot be pulled, jarred, or shocked loose... perfect electrical contact and minimum power losses are assured. Powerful mechanical linkages with single coil design provide sim-

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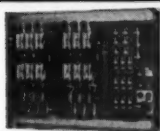
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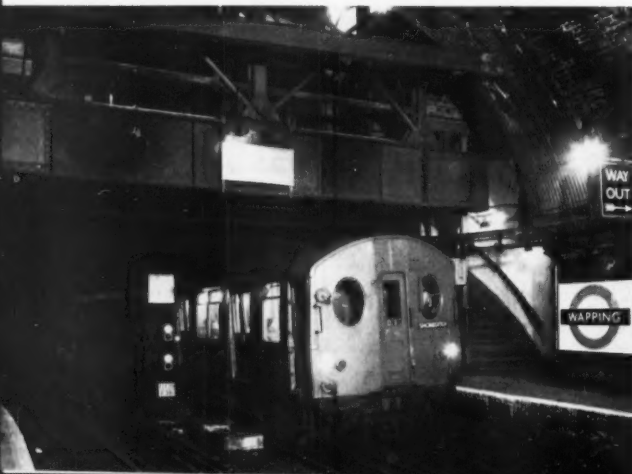




First Thames Tunnel traffic was pedestrian only.



Steam train service began in the tunnel in 1869.



Under the Thames

The First Under-River Tunnel

F. C. LIVINGSTONE

ISAMBARD KINGDOM BRUNEL is best known as builder of Britain's Great Western Railroad, but the Thames Tunnel, between Wapping on the north bank and Rotherhithe on the south, is his greatest single achievement. It was the first large under-river tunnel in the world, and though it actually was designed by his father, Sir Marc Brunel, Isambard was resident engineer for much of the work.

The Thames Tunnel originally was designed for vehicular traffic, and it was supposed to have inclined roads running down to it from surface level, but these roads were never built. Instead, for more than 20 years, it served as a subway for foot passengers, saving a journey of some two miles by way of the nearest bridge — or a dangerous trip by rowboat ferry. The tunnel was taken over by the East London Railway, in 1865, and this line now forms part of the vast and deep London subway system. Brunel's original shafts and twin-tunnel are still in use.

The Wapping station, badly damaged by bombs during World War II currently is being reconstructed. When the work is complete (in the centenary year of I. K. Brunel's death in 1859) it will bear a plaque with this tribute to two great engineers and their greatest engineering achievement.

"It was designed by Sir Marc Isambard Brunel (1769-1849) and completed in 1843. His son,

Electric trains have been in operation since 1913.

CONSULTING ENGINEER

to Wapping



Isambard Kingdom Brunel (1806-1859) was engineer-in-charge from 1825 to 1828."

Early Plans

The first recorded proposal for a tunnel under the Thames came in May 1798, when Ralph Dodd advocated a 2700-ft tunnel between Gravesend and Tilbury, some 20 miles further down the river. No work was ever done on this scheme, and the idea languished until 1802, when Robert Vazie proposed a tunnel between Rotherhithe and Limehouse, a mile below Wapping. A considerable amount of capital was raised for Vazie's scheme, and the "Thames Archway Company" was incorporated by Act of Parliament in 1805.

Vazie started work on his tunnel by sinking an 11-ft shaft about 300 feet from the river at Rotherhithe. There proved to be an incessant flow of water into the workings, and when the shaft had

reached a depth of 42 feet, the money ran out. More money was raised, and digging continued with the shaft reduced to 8 feet in diameter. At 76 feet below ground level, quicksand was struck.

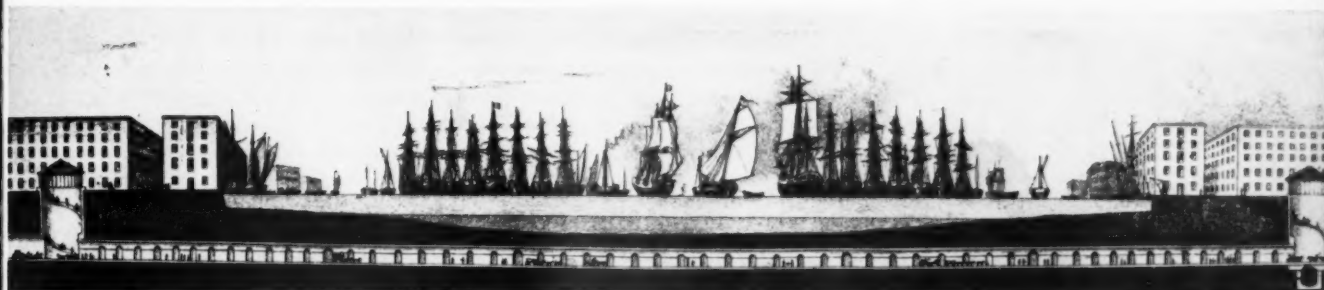
At this stage, that astonishing Cornish engineer, Richard Trevithick, whose Penydarren tramroad steam locomotive had appeared at Merthyr Tydfil, in 1804, was called in to assist Vazie as resident engineer. Very soon, however, Vazie was dismissed and Trevithick was given full charge. He decided that the first step should be the driving of a pilot tunnel 5-ft high and 3-ft wide, and in six months his team of Cornish miners, working in this confined space, had driven 1000 feet of the 1200-ft tunnel and had reached low water mark on the Limehouse side. In a sense, therefore, it may be claimed that Trevithick's men were first across, or rather under, the Thames. At this point, on January 26, 1808, the river broke in, and work had to be stopped. There were no casualties.

Trevithick proposed that work should continue under the protection of a coffer dam, but the directors of the company called in consultants to advise on the possibilities. One of them, William Jessop, declared roundly that it was "impracticable to make under the Thames a tunnel of useful size by an underground excavation." A proposal put forward by Trevithick to build coffer dams and lay large cast iron pipes to form a tunnel was rejected (although the principle has been used successfully since), and work on the tunnel stopped.

Brunel's Work

Ten years later, in 1818, Marc Isambard Brunel patented his invention of a shield for tunneling. The principle on which it was based was said to have occurred to him when, while working at Chatham Dockyard on the installation of the block-making machinery he had invented, he saw the action of the tunneling *Teredo navalis* (shipworm) in the timbers of naval vessels.

One of the promoters of the former Thames Archway Company heard of this invention and



Although originally designed for vehicles, the roadways beyond the shafts, as shown here, were never completed.



While construction was in progress, a small admission fee allowed the public to wander about tunnel workings.

persuaded Marc Brunel to talk to him and some of his friends about his tunneling methods. As a result of this meeting, a bill to incorporate a Thames Tunnel Company was laid before Parliament and received the royal assent in July 1825.

Marc Brunel was appointed engineer and given \$25,000 for the use of his patent method of tunneling. The tunnel was to start near St. Mary's, Rotherhithe, and reach Wapping near the junction of Wapping Lane and Wapping High Street.

A shaft was sunk on the south bank by building a brickwork cylinder on a cast-iron ring, the first brick being laid on March 2, 1825. As the ground within the ring was excavated, it was expected that the weight of the brickwork would force the cylinder down into the ground. The cylinder was 50 feet in diameter and 42-ft high, and it was built to its full height in three weeks. When excavation started, the rigidly-braced cylinder, weighing perhaps 1000 tons, descended at the rate of 6 inches a day. It reached its ordained depth on June 6. A sump was built at the foot of the shaft to contain water draining from the tunnel workings and pumps were mounted above this sump.

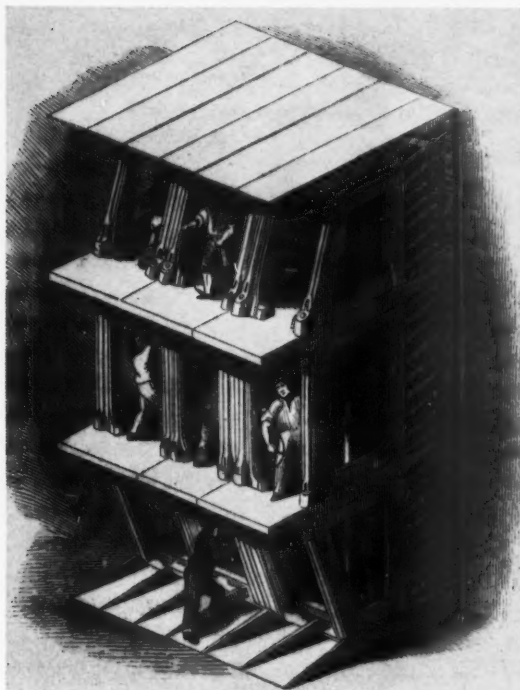
Tunneling Method

The shield itself then was installed. This consisted of 12 massive cast-iron frames, each 3-ft wide and

21-ft 4-in. high. Each frame was divided into three compartments, one above the other, making 36 compartments in all. Massive plates below the frames served to support them and other plates held up the ground above. Similar plates were provided at the sides of the outer frames. The whole formed a rectangular box with an open front. This opening was closed by stout oak planks across each of the 36 compartments, the planks (or "poling boards") being pressed against the face of the excavation by adjustable "poling screws," one end of which fitted in a recess in the plank and the other in a recess in the frame. Each plank had two poling screws to support it, and the screws could be adjusted within a range of $\frac{1}{4}$ inches.

One man worked in each compartment, the method being to remove one plank, cut away the ground behind to a depth of $\frac{1}{4}$ inches, put the plank back with the poling screws extended, and then repeat the performance until all the ground beyond the compartment had been cut away for $\frac{1}{4}$ inches. A staging on wheels behind the shield had a hoist for carrying away the spoil.

Bricklayers building the tunnel lining worked back-to-back with the man at the shield, and when the earth in all 36 compartments had been cut away, jacks, using the newly-completed brickwork as an anchorage, thrust the whole shield forward



Cast iron tunnel shield was invented by Marc Brunel.

4½ inches. As the frames could not be moved with the poling screws in place, arrangements were provided which allowed the poling screws of one frame to be supported on those on both sides of it. The frame itself then could be moved forward, the retracted screws put back on their proper frame, and the process repeated for the neighboring frames until all had been moved forward. The entire cycle then started again.

Except for the 4½-in. ring in front or behind the shield, the tunnel was supported at all times by the shield or the brickwork. Complaints of slow

progress forced Marc Brunel, against his will, to increase the distance of the "steps" to 9 inches and agree to piecework payment, a method he felt would lead to shoddy work.

The first resident engineer was William Armstrong, but he resigned because of ill health the following April (1826) and his place was taken by the 20-year-old Isambard Kingdom Brunel.

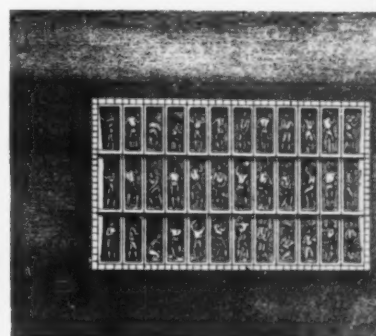
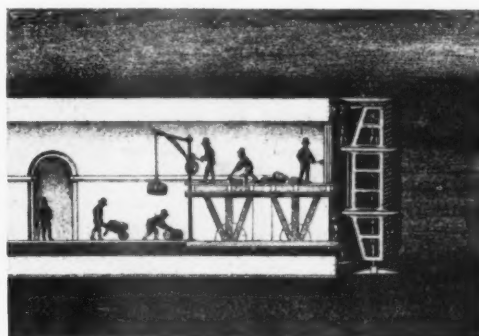
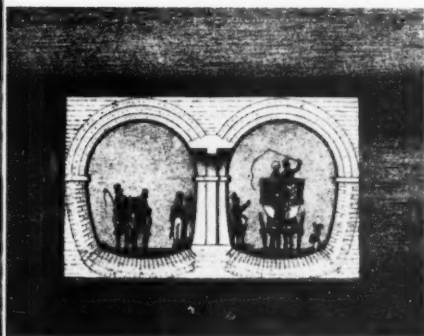
The younger Brunel rapidly became the real director of the tunnel works, and despite his youth won the respect of engineers and workmen alike. He would spend long hours in the foul atmosphere — often as much as 36 hours at a time — and on one occasion, after an influx of water from a pocket in the river bed, he spent six days and nights on end in the tunnel, sleeping only in snatches.

His stamina and energy is all the more remarkable when it is recalled that the Thames at that time was little more than a huge open sewer. The water trickling into the tunnel brought "foul stench," and the rate of sickness was high, fever being common and blindness frequent. One of Brunel's three assistants, Riley, died of fever after two months in the tunnel, and another, Richard Beamish, who was to survive to write his *Memoir of the Life of Sir Marc Isambard Brunel*, became blind in one eye. I. K. Brunel himself was sick in 1826 but recovered quickly.

When the shield had penetrated about 300 feet under the river, the directors of the company, who were anxious to make up in any way they could for the cost of the delays, began to admit visitors at a shilling (then about 25 cents) a head. The presence of these visitors seems to have been a constant source of worry to the younger Brunel, who was always afraid of the river bursting in while the tunnel was crowded.

Difficulties Encountered

Towards the end of April, it became evident that the tunnel was very near the bed of the river, and



Early sketches of Thames tunnel show details of work at face. Crew of 36 men worked on three elevations.

considerable quantities of water and silt were running into the workings. At the end of the month, Isambard Brunel made one of his frequent descents to the bed of the river in a diving bell and found he could touch the top of the shield with a stick pushed through the mud.

By early May, Brunel had recommended that the tunnel be closed to visitors, but the directors do not seem to have agreed, for on May 18, Lady Raffles and a party of visitors were shown round the workings by Brunel and Beamish. That same night the river broke through in force, the mud flow rapidly changing to a torrent of clear water. Brunel, who was in the office at the top of the shaft at the time, ran down the stairs in time to see Beamish being helped out by two men.

In the confusion, the engineman was left in the bottom of the shaft. On hearing his cries for help, Brunel called for a rope and went down into the water and debris. He managed to tie the rope around his waist and both were hauled to safety. A roll-call established that everyone had been saved. Brunel made an immediate descent in the diving bell and discovered that the cause of the break was a trench in the bottom of the river made by dredging. The elder Brunel organized the dumping of bags of clay on the river bed, sealing the breach.

On June 13, Isambard Brunel was able to penetrate as far as the shield by boat and found it still intact. By November, the whole tunnel and shield had been cleared. On November 10, 1827, a dinner party was held in the tunnel in celebration. In one arch tables were arranged for Isambard Brunel and over 40 guests. In the other arch of the twin arch tunnel 120 workmen dined. One of the Guards bands played during dinner, and the occasion was marked by the presentation of a pickaxe and shovel to Isambard Brunel by the workmen.

On January 12, 1828, the water broke in with even greater force than before. Six men were caught by the water or collapsing timber staging and were drowned. Brunel, doing his best to see that everyone was clear, had his leg seriously injured by falling timber.

Despite his injuries (it later was found that he had internal injuries in addition to those to his leg), he insisted on remaining on the site until investigations with the diving bell had been completed.

This was his last work on the tunnel. He went to Brighton to recuperate from his injuries, and while he was away several thousand tons of clay were dumped into the river to seal the tunnel. His father supervised the clearance of the workings.

The directors of the company, however, were divided among themselves as to the wisdom of going on, and funds were running low. In August 1828, they ordered the end of the tunnel against

the shield to be bricked up. A large mirror was installed against the end wall, and the tunnel became one of the sights of London for visitors. Local wits referred to it as the Great Bore.

Efforts Renewed

After some difficult years, Isambard Brunel went on to win fame, as builder of the Great Western Railway, but Marc Brunel went back to work on the tunnel again in 1835. Richard Beamish, became resident engineer.

The old shield had to be replaced by a new one, a task not completed until March 1836. From then on work continued slowly and conditions worsened.

In October 1840 the sinking of the Wapping shaft began, and by the time it was finished, over a year later, the shield had advanced nearly to it. Early in 1841 a drainage tunnel was cut from the new shaft to the tunnel, and Isambard, the three-year-old grandson of Marc Brunel and son of I. K. Brunel, ran through the drainage tunnel and out the other side to become the first person to cross from bank to bank beneath the river. The occasion was marked by the knighting of Marc Brunel.

On December 15, 1841 the shield reached the Wapping shaft, and the tunnel was complete. The opening ceremony was held on March 25, 1843, and an official procession, complete with band, marched along the western archway of the tunnel, climbed the stairway at Wapping, descended again, and marched back to Rotherhithe.

It is recorded that during the first weekend of its opening 50,000 people paid a penny (about 2¢) each to pass through it. It had cost \$3 million, but it could be used only as a pedestrian subway, for the money never was forthcoming to make the inclined approaches that were needed for wheeled traffic — despite an appeal from Sir Marc to the Queen herself.

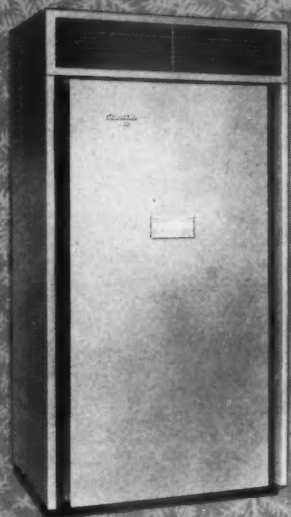
Train Service

In 1865 the tunnel was acquired by the East London Railway (which never ran a train of its own), and in 1869 train service began with 23 trains a day in each direction, the service being provided by the London, Brighton, and South Coast Railway with which there was a physical connection.

In 1913 the East London Line was electrified, without interference to traffic, and the tunnel became part of the electric subway system. When the railroads were nationalized in 1948, the line passed to the London Transport Executive. It is a tribute to the sound design of Marc Brunel and to the good workmanship insisted on by I. K. Brunel that the tunnel has withstood for so long the vibration (entirely unforeseen by the builders) of steam and electric train service. ▲▲

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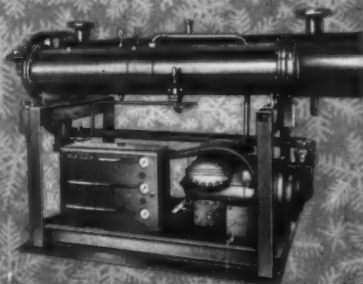
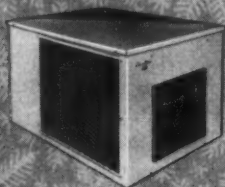
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A Report for *Consulting Engineer*

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Pier Luigi Nervi designed this 50,000 seat stadium, combining in situ and precast concrete elements.



Cexclusive THE TREATY establishing a Common Market between the Benelux countries, France, Germany, and Italy will affect the engineering profession of the six nations, just as it is affecting almost every form of economic activity in Little Europe. Engineers in the Common Market area are awaiting with interest the implementation of those articles of the Treaty which provide for the lifting of national professional discriminations and establish the right of any national of Little Europe to practice freely in all six countries.

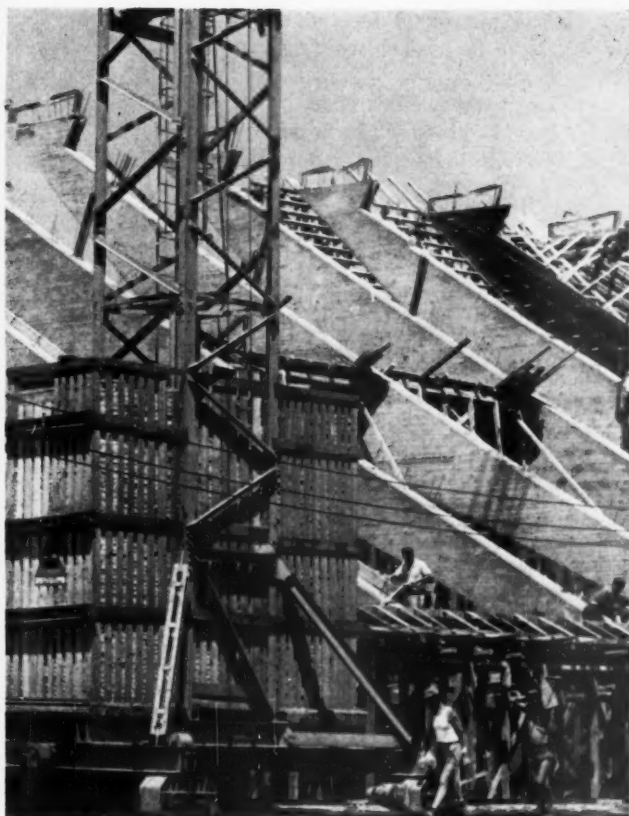
In fact, engineering and architecture probably will be among the first professions to benefit from the lifting of national discriminations. Preparatory work on the creation of a "European Register of Engineers and Architects" is going ahead. It is likely that Common Market engineers will be entitled to practice freely not only in any of the six countries but also in their dependencies. The subject is being studied by a special committee set up by the Common Market's governing Commission and by national and international conventions organized by the engineering and architectural professions of the six nations.

Many obstacles have got to be overcome; first among them is that all six nations must agree upon the definition of an engineer. The plan is to create, by the end of next year at the latest, a first provisional register of engineers and architects entitled to practice in all the Common Market nations. This preliminary register probably will include not more than 500 engineers and architects.

Italian Definition

Since Italy is one of the Common Market nations, Italian engineers are vitally interested in the way they will participate. They are wondering how their definition of "engineer" fits with those of the other five countries.

In Italy only university graduates are entitled to call themselves engineers. The use of the title "engineer" by someone who has not graduated in engineering at a university is, by law, a serious offense. The profession and title of engineer are, in fact, strictly safeguarded by a number of laws. After graduating from a university, an engineer is not entitled to practice until he has undergone a state examination and has been duly enrolled on the register of engineers. To obtain enrollment on



the register, candidates not only must pass the examination and prove that they have graduated but also must show that they are Italian citizens and have not committed any criminal offenses.

Each of Italy's 92 provinces has its provincial register, whose upkeep is the responsibility of the provincial engineering guilds — or "orders," as they are called in Italy. An 11-member National Council of Engineers acts as a court of appeal against decisions made by provincial "orders," and this National Council also is required to advise the Government, when requested, on the drafting of new laws affecting the engineering profession.

The powers of the engineering guilds are in many ways similar to those of the doctors' guilds. A provincial guild may reprimand, suspend, or even strike an engineer off the register for unprofessional behavior or on moral or legal grounds, and an engineer who has been struck off cannot practice his profession. However, the defendant is entitled to appeal not only to the National Council but even to Italy's Supreme Court if a point of law is involved.

The self-governing nature of the profession is shown by the fact that the councils of the provin-

cial orders are elected by all the engineers on the provincial register. These councils, in turn, elect the National Council. In this, as in other respects, the organization of the profession is similar to that of Italian lawyers and doctors, all of whom have their orders descended from the medieval trade guilds. Thus there is a closer kinship between these varied professional groups than is perhaps true in the United States.

There exist also a number of engineering associations, but whereas membership in the provincial guild is compulsory, membership in the associations is voluntary. The largest is the National Association of Engineers and Architects (ANIAI), but its functions are social and cultural rather than technical. There is also an association of Free Practitioner Engineers.

Private Practice

In Italy consulting engineers are known as "liberi professionisti" or free practitioners. In theory every engineer who is on the register is entitled to be a free practitioner unless he has a permanent occupation or employment, the terms of which bar him from private practice. Thus, engineers who are in permanent government employment may not practice without securing from the public authorities a special permit for each personal project they undertake.

However, this rule is not sufficient in itself to prevent engineers in public employment encroaching on the activities of consulting engineers. Thus, in practice, some fields of engineering have come to be the almost exclusive privilege of senior engineering civil servants on the active or retired list. In particular, the conducting of the tests required by law when major public buildings or public works have been completed show a most noticeable tendency to become the preserve of civil service engineers.

The intrusion of publicly-employed engineers into the field of private practice is a sore point in the profession, and there is rarely a meeting of engineers in the course of which this subject is not heatedly debated. Several attempts have been made in recent years to require all engineers to declare to their guilds their exact status and occupation. It was hoped in this way to curb the intrusion of civil servant engineers into the activities of private consultants and also to ascertain the number of engineers in private practice. But these endeavors failed completely, and private practice is subject to a severely competitive situation.

An attempt also was made recently to change the law concerning the register of engineers so as to include in it only those in private practice, thus barring state-employed engineers from private con-

sulting activities. But the majority of the profession rejected the proposal, again leaving the engineer in private practice at a disadvantage.

Code of Ethics

The professional behavior of Italian consulting engineers is governed by a code of professional ethics, and minimum fees are established by law. The Table of Fees applies also to consulting architects, for the tasks of the two professions are quite similar in nature.

"Ethical Rules for the Exercise of the Engineering Profession" was drafted by a committee appointed for this purpose by the National Council of Engineers. After consulting the 92 provincial orders, the National Council approved it on March 16, 1957. It seems, however, that no sanctions are to be applied to those who do not comply with it, so it is unlikely that it is of much importance. It boils down to a statement of what good engineers would like good engineers to be, and is perhaps more limited in value than similar codes in other countries where adoption and policing is carried on at the local level.

The 16 articles of the code deal with:

¶ The engineer's relations with his provincial engineering guild

¶ Relations with his colleagues

¶ Relations with his clients

Its requirements are detailed and far-reaching. An engineer is required to cooperate with the guild at all times and to provide it with whatever information, clarification, or documentation the Council may require. He may not sign projects which were not drafted under his supervision or offer his professional guarantee for work not carried out under his direction. He should not attempt to supplant colleagues who are about to obtain a commission, and if called to replace a colleague, he is expected to inform him and make certain that the fees to which he is entitled have been settled, or ask for the permission of the Council of the Order before accepting the job.

If he does carry out a task started by a colleague, he is enjoined to refrain from disparaging criticism, and in charging for his work to comply with the fees set by law and not offer rebates. Nor should he participate in contests or submit bids if the conditions of the contest have been stated to be unacceptable to the guild. Engineers in public or private employment who normally are not entitled to practice privately should inform the guild of any authorization they receive to do so, in order to make their change of status a matter of record.

The chapter on relations with clients, among other things, requires an engineer to maintain professional secrecy and to inform his client if he has

any ulterior interest in the building materials or procedures to be used in work he has planned or is to supervise.

It can be seen that this code is quite similar to the Canons of Ethics, which is generally accepted by engineers in the United States.

Fee Schedules

The official table of fees for engineers and architects is an extremely complex document covering every possible field from the construction of a house, public works, shipbuilding, ship salvage and repairs, hydraulic and railway projects, land reclamation, mining, topographical work, and industrial plants to official tests of completed works. Fees usually are based on a percentage of the total cost of the work with the percentage decreasing as the total cost increases. However, it also is possible for fees to be based on other criteria such as a per diem, although this is less common than in the United States.

Thus, the fee recommended for the engineer who has planned and supervised in all its stages the construction of a multistory residential building, the total cost of which amounts to \$50,000, would be 8.82 percent of the total cost. But if the total cost were \$500,000, the fee would be reduced to 4.41 percent. To say, however, that the official scale of fees is strictly adhered to would be a gross exaggeration. Fee cutting is by no means unknown in spite of the fact that these minimum fee schedules are established by law.

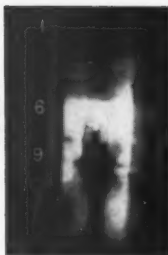
Engineer-Architect Equality

From a practical point of view there are few distinctions between a graduate in engineering and a graduate in architecture in Italy. There is only one activity which is reserved by law to architects — the restoration of monuments. Otherwise, both engineers and architects are equally entitled to assume responsibility for every kind of design.

The architectural profession is organized on the same lines as engineering. There are about 8000 architects on the architectural professional register, and the vast majority of them are "free practitioners" or consulting architects. However, many consulting architects devote themselves to activities of an artistic nature, such as interior decoration and industrial design — fields usually neglected by engineers.

There are just over 30,000 engineers listed on Italy's registers. But this number includes engineers of all kinds both in public and in private employment. The exact number of consulting engineers is not known. Most civil engineers oscillate between employment by big companies, contracting activities, and free practice as consulting engi-

Doctor's code flashing on Edwards Paging Annunciator, Fisher-Titus Hospital.



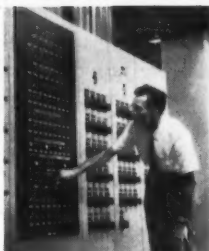
Edwards seven-circuit sectionalized Clock Control Board with Automatic Reset Control, Grady Memorial Hospital.



Edwards Doctors' In & Out Register and Flush-Mounted 12" Clock. Operator places call on Silent Paging System, Fisher-Titus Hospital, Norwalk, Ohio.



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neers. A reasonable estimate is that there are around 4000 or 5000 consulting engineers currently engaged in private practice.

Contractor Background

Most Italian consulting engineers, at one time or another in their lives, have been contractors, big or small, or have been associated with one. Thus, many of Italy's largest contracting companies, for example the Lodigiani and Girola Companies which built the Kariba Dam in Rhodesia, belong to engineers. Both Signor Lodigiani and Signor Girola are engineers, and their companies specialize in the construction of hydroelectric dams, both at home and abroad.

Another well known Italian contractor, Signor Astaldi, is also an engineer. His company has undertaken major public works in various parts of Africa. Yet another noteworthy contracting firm is Nervi and Bartoli. Signor Nervi is an engineer and is considered to be Italy's reinforced concrete wizard. These firms do both engineering and construction.

A few, such as Techint, of Milan, do only engineering in Italy, but do both construction and engineering abroad. But it also is true that some of the biggest contracting companies are owned by men who "came up for the mess tin," as the Italian saying goes, and started in business as masons or small builders.

Contract Arrangements

Italian engineers have no scouting system to obtain work. Reputation and friends are the great work-finding channels and the second, in many ways, is the more important of the two. Public bodies, governmental departments, and municipalities usually call for the submission of designs for major public works and buildings, and a commission composed of officials and of a few consulting engineers and architects of great prestige select the winning design.

Although, under Italian law, for a project to be legally valid only the signature of one engineer, or alternatively of one architect, is required, it is becoming more and more frequent for consulting engineers and architects to team together for the elaboration and submission of important projects. Sometimes the teams are purely ad hoc, but the number of permanent teams is growing and the engineer-architect, or vice versa, firm similar to those in the United States is not uncommon.

Not infrequently "package projects," including the design and a bid on its construction, are called for. To handle these, consulting engineers team up with a contractor to submit an inclusive offer for the planning, supervision, and construction. This

is the only way they can compete with the large engineer-contractor firms.

Engineering Education

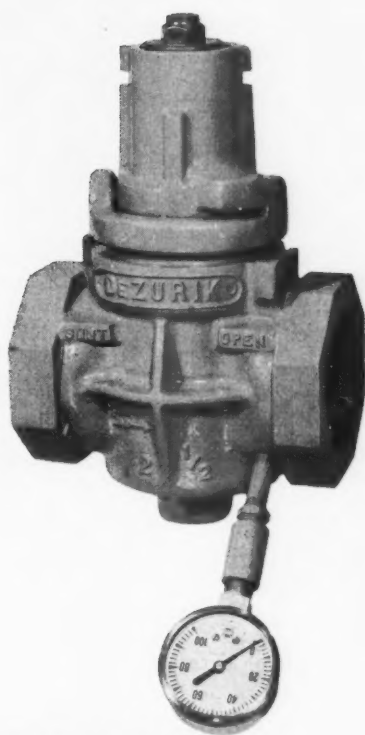
A university course in engineering is considered one of the most difficult in Italy. The course lasts for five years, but few students succeed in graduating in that time. Instruction is given in six main branches: civil, industrial, mining, naval, aeronautical, and electronic engineering. Civil and industrial engineering in turn are each subdivided into three subsidiary branches: building, transportation, and hydraulics in the case of civil engineering; and mechanical, electrical, and chemical in the case of industrial engineering. The first two years of the five-year course are common to all the branches. But even after the first two years it is not difficult for students to pass from one subsidiary branch to another.

Italian law makes no distinction between engineering graduates and, in theory at least, a chemical or an aeronautical engineer is entitled to sign the project for a skyscraper and supervise its construction just as much as a civil engineer is. A revision of Italy's entire engineering education and registration system is being urged, and a less comprehensive but more specialized training has been suggested. But this plan is being strongly opposed by almost all the engineering profession, as it is feared that a change of this kind would lower the general educational requirements for engineers and, therefore, the high standing of the profession. The status of the five year program is as sacred to the Italian engineer as the four is to the American.

Italy's Engineers Face Bright Future

Italian engineers benefited from the post-war shortage of housing and from the extensive reconstruction of railways, roads, and public works which had to be undertaken. In the last two or three years, the demand for new housing has slackened, and there has been a slowing down of activity in the whole building trade as a result of the slowing of Italy's general economic expansion. However, the efforts to develop the backward areas of Southern Italy, which are entailing vast housing, road, and public works schemes, as well as water control and conservation, irrigation, and land improvement plans, are a continued source of work for Italian engineers. An increasing number of them, furthermore, are being called upon to draft projects in the development programs of many nations of the Middle East. After two years of slower general economic development, Italy now is approaching a new period of expansion which will carry with it brighter prospects for her consulting engineers engaged in private practice. ▲▲

WHY
USE
TWO...



WHEN
ONE
WILL DO?

DeZURIK BALANCING VALVES FOR AIR CONDITIONING SYSTEMS

For many years it was thought two valves were necessary on each line to balance an air conditioning system a globe valve for balancing and a gate valve for shut off. Now, every day, more and more Consulting Engineers are specifying one DeZurik Valve to replace the globe and gate combination that was formerly used.

DeZurik Balancing Valves have excellent throttling characteristics for precise balancing. And they shut dead tight!

They're equipped with a tapped hole on the downstream side of the body to accommodate a pressure gage — no need to drill and tap the line. Once the system is in balance and the adjustable open stop positioned, the line may be shut down — dead tight — for necessary maintenance on pumps, strainers, etc., and returned to proper balance by opening the valve to the stop.

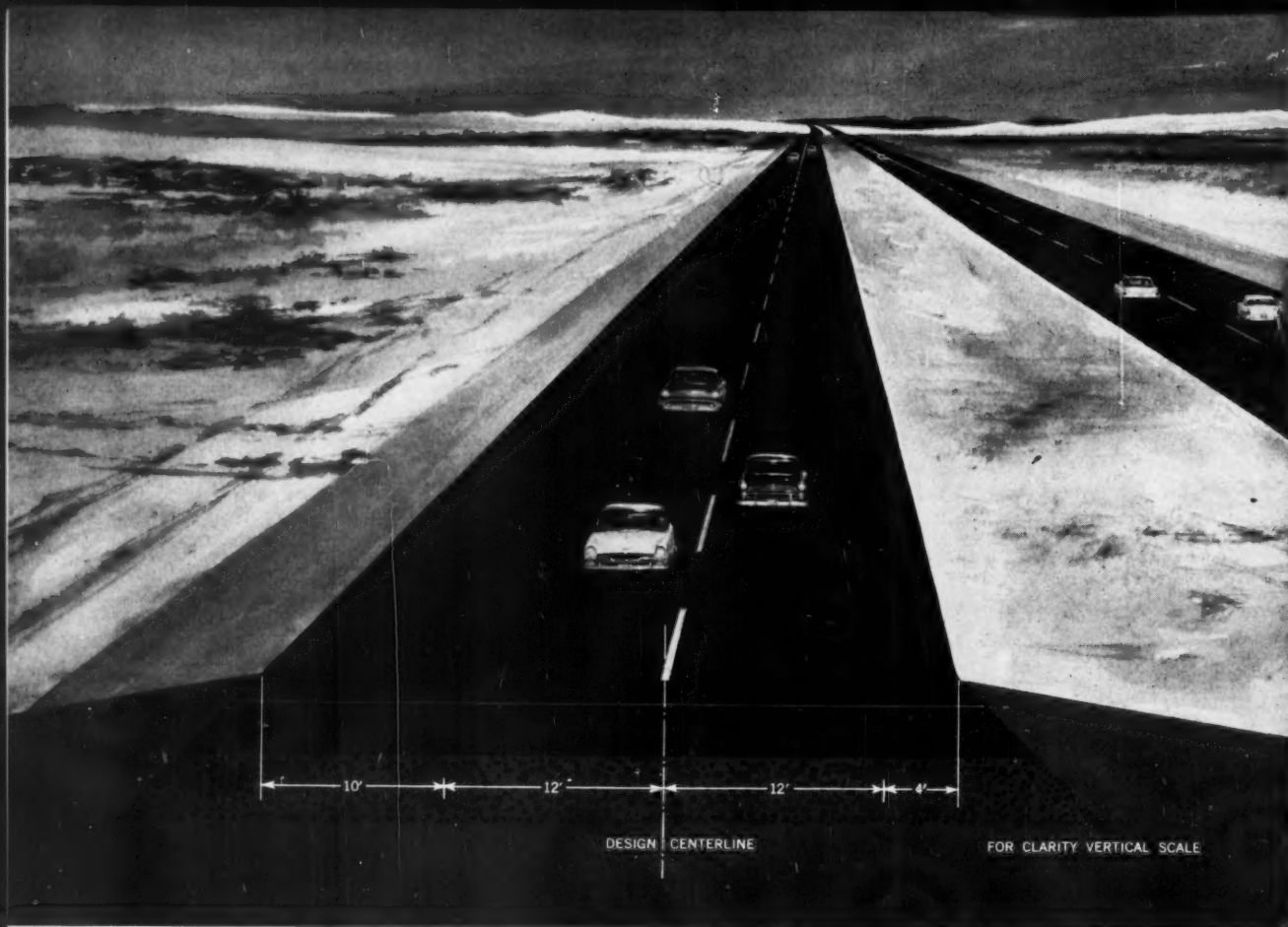
This one DeZurik Valve saves money in other ways, too! It's easier to install, needs no maintenance, lasts far longer!

Available in sizes 1/2" thru 20", in 2-way, 3-way or 4-way models, with manual, on-off or positioning actuators.

 **DeZURIK**
CORPORATION
SARTELL, MINNESOTA

Only DeZurik Valves give you all these advantages:

- | | | |
|-----------------------------------|--------------------------|------------------------|
| 1. Easy Operation | 2. Drip Tight Shut-off | 3. Low Pressure Drop |
| 4. Best for Balancing | 5. Low Installation Cost | 6. No Maintenance |
| 7. Proved Record of Dependability | 8. Compact Size | 9. Economically Priced |
| 10. Versatility beyond compare | | |



Arizona's First Interstate

Experience with veteran 2-lane Asphalt



Arizona is a big state with a low population density—which means it needs plenty of roads. But there aren't millions of Arizonans to pay for them. Every dollar counts.

These are some of the reasons why most of Arizona's roads traditionally have been of economical Asphalt construction. Time and again, since the State began to pave, Asphalt pavements have stretched available funds over more and more of these long Arizona miles than could any other pavement type.

Now, along with the rest of the states, Arizona has launched a vast new road-building program. And even though more federal aid is available than ever before, these roads, too, are turning out to be Asphalt-paved. You don't have to look far for the reasons.

Arizona's veteran Asphalt-paved highways have proved themselves as rugged and durable as they were economical to build and maintain.



U.S. Route 66 between Winslow and Holbrook is an example. First paved more than 25 years ago (with Asphalt and sand!), this pavement is successfully supporting heavy traffic undreamed of when it was first built. "Double" trucks by the dozen barrel over it at 60 MPH. So does the bulk of Arizona's east-west traffic.

Now this veteran main artery, still in the prime of its life, is being given local traffic responsibilities. A new divided Interstate Highway (Route 40), carrying through traffic, will parallel it. The initial section of Arizona's new Interstate 40 is shown above. It is a 5.6 mile stretch between Winslow and Holbrook.

With no aggregate larger than 3/4 inch available (and most under 1/4 inch), only Asphalt construction could have been used to build this section of pavement up to Interstate standards. Total cost of the pavement structure was \$1.75 per square yard!





Segment Asphalt-Paved!

pavements leads to decision

The cross section above shows you in detail how low-cost Asphalt materials were used to give this pavement lasting strength despite the scarcity of aggregate.

Notice, first, the use of Asphalt in the 3-inch base. This base, a sandy gravel, was road-mixed on the selected sub-base using RC-3 liquid asphalt.

Notice, second, (see right roadway above) that the 3-inch leveling course was asphalt plant-mix laid down in two courses. A novel between-course inter-lock was provided by "waffling" the lower course while still hot with a 4-inch square grid pattern, impressed about $\frac{3}{8}$ -inch into the surface. A tack coat was applied and a second course constructed. Then, a $\frac{1}{2}$ -inch wearing course was laid to insure a non-skid surface.

Notice, third, that both base and surface courses are uniform across the whole width of the road, shoulders as well as traffic lanes.



Notice, fourth, the use of Asphalt curb to provide controlled drainage, prevent embankment erosion and aid safety.

BEAT SCHEDULE BY TEN WEEKS

With today's equipment, modern heavy-duty Asphalt concrete pavement is being laid at record, reputation-building, tax-fund-conserving speeds. In this case, construction was completed 10 weeks ahead of schedule . . . in plenty of time to accommodate the bulk of the summer tourist traffic.

Modern Asphalt concrete pavement can help you speed your highway modernizing program. It provides, as well, strength, durability and economy in full measure. Specify it for your Interstate Highways. Primary and farm-to-market roads, too.

Ribbons of velvet smoothness...
ASPHALT-paved Interstate Highways

THE ASPHALT INSTITUTE

Asphalt Institute Building, College Park, Maryland





INTEGRATED MANUFACTURING guides Goulds pumps through the foundry, machine shop and assembly plant to you.

Result? You get a pump that's made to order for the job it must do.

Manufacturing pumps "from foundry to finish" also cuts costs. That's why you get a *better* pump from Goulds—made from high-quality, precision parts—at no greater cost than other pumps.

And, because it's not a mere assembly job, a Goulds pump can be designed and built for interchangeability

—to cut your spare parts inventory and maintenance costs.

To completely control the production of our designs, we had to build the world's largest plant devoted to the manufacture of pumps exclusively. Over 100 years of experience gives us the know-how.

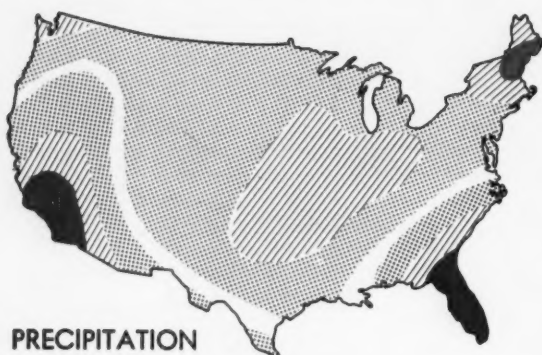
For help in solving *your* pumping problem, write to Goulds Pumps, Inc., Dept. CNE-119, Seneca Falls, N.Y.

GOULDS  PUMPS

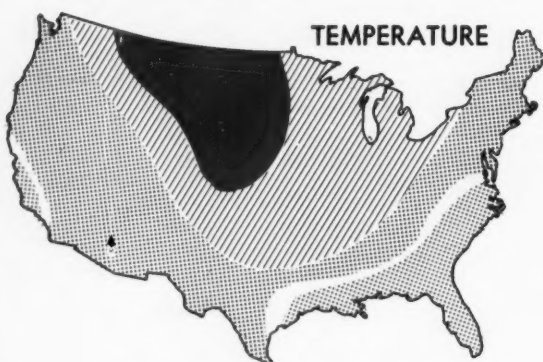
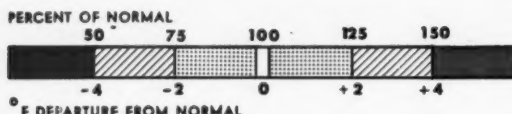
KRICK WEATHER OUTLOOK

NOVEMBER 1959

Prepared Exclusively for CONSULTING ENGINEER



PRECIPITATION



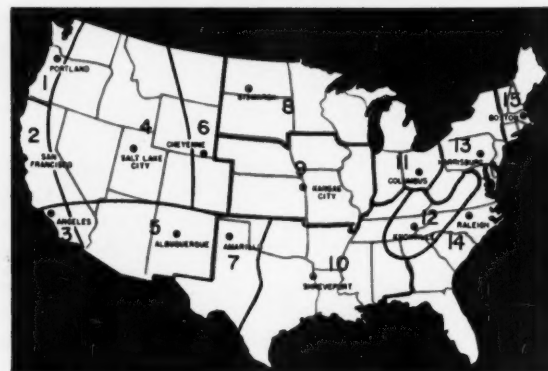
TEMPERATURE

NOVEMBER HIGHLIGHTS

November 1959 will be predominantly colder than usual over the United States. Temperatures should average below normal nearly everywhere except in the extreme southeastern portions of the country and along the coastal regions of California where near to slightly warmer than normal conditions should prevail. Over the Missouri River Basin, temperature readings should range much colder than normal, as repeated surges of cold Canadian air penetrating southeastward into the country are anticipated. Look for predominantly drier than normal conditions in the southwestern sections of the country and also the Florida Peninsula. These dry sections should receive only half to three-quarters of the normal November precipitation. Frequent storminess is expected to develop off the Pacific Northwest coast. As these storms move inland, they should bring above normal moisture to extreme northern Washington. These stormy patterns should progress rapidly across the central portions of the country triggering frequent storminess and bringing cold air. As a result, above normal moisture is expected along the path of these storms. Expect heavy moisture concentrations throughout the area extending from eastern Minnesota to the Ohio Valley and southward to the northern Plains of Texas, and also in the New England states. As a whole, construction weather should be hampered somewhat over much of the U.S. since relatively cold temperatures and storminess will be frequent events. Only those areas with the warmer and drier conditions should expect near normal construction weather.



TEAR OUT ALONG PERFORATION.



CONSTRUCTION DAY FORECAST LOCATIONS

CONSTRUCTION DAY CRITERIA

To be considered a construction day on these charts, the day's maximum temperature must be more than 38 degrees. There must be less than six inches of snow on the ground. There must be less than six hours of active precipitation during the period between the hours of 7 a.m. and 5 p.m. There also cannot have been more than one inch of rainfall on the preceding day.

CONSULTING ENGINEER

These forecasts are prepared by Irving P. Krick Associates, Inc., the world's oldest and largest weather engineering firm. The forecasts are based on methods developed by this group at California Institute of Technology prior to World War II. After the War, the methods were adapted to high speed electronic computing machines to shorten the time required to solve the complex problems of the atmosphere. Ultra-long range forecasts, up to a year or more in advance, are now available. Information on other Krick weather services is available by writing to the home office of the firm at 460 South Broadway, Denver, Colorado.

CONSTRUCTION DAYS

NOVEMBER 1959 ESTIMATES															
LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	26	30	30	29	30	30	30	27	30	30	27	29	29	30	27
LOWEST	17	23	26	16	22	15	21	6	18	24	13	21	18	22	17
AVERAGE	21	26	28	22	28	21	27	15	25	27	21	25	23	27	22
ESTIMATE	19	25	29	22	27	21	26	11	18	27	18	21	19	27	18

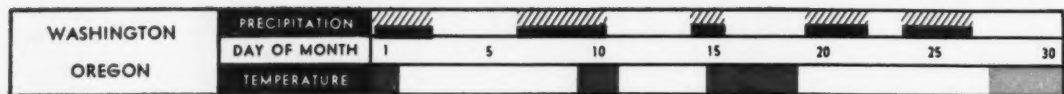
These estimated construction days for key cities in the United States should be interpreted as an average of estimated conditions over the forecast area. To obtain the best results, the forecast number of construction days should be compared with the temperature and precipitation anomaly maps and the timing estimates to determine the probable number of construction days in your locality. The forecast construction days are based on average construction day requirements as defined under "Construction Day Criteria," and should be adjusted for individual operations.

DECEMBER AVERAGE AND RANGE*															
LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	26	30	31	22	31	24	29	11	25	29	22	28	20	31	21
LOWEST	12	21	26	8	21	11	21	2	10	22	5	17	6	13	7
AVERAGE	20	26	29	15	25	18	26	5	17	26	13	22	13	24	15

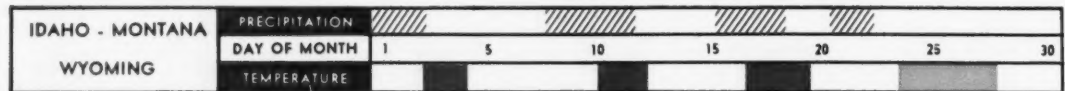
JANUARY AVERAGE AND RANGE*															
LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	30	30	30	24	31	26	30	15	21	29	16	28	23	29	16
LOWEST	4	20	23	0	16	1	13	0	8	18	1	15	1	18	2
AVERAGE	16	27	28	11	24	16	23	5	16	23	11	22	14	24	10

*Historical Average, Not a Forecast

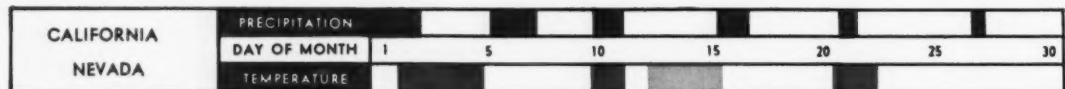
NOVEMBER 1959 TIMING OF SI



Slightly cooler than normal temperatures are expected over this two-state area during November. Nighttime readings will drop into the 30s in coastal regions during the cold intervals indicated on the timing bar, and into the 20s at some inland localities.



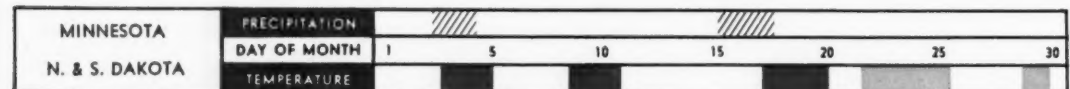
Precipitation totals in this area should range from near to slightly more than usual. During the cold spell centered around the 18th of the month, nighttime low temperature readings ranging well below zero are anticipated for the Billings-Bozeman area.



Rainfall totals during the month are expected to vary from near normal in northern portions of this two-state area to half the normal amounts in southern regions. Throughout these southern valleys, the precipitation totals should be less than three-quarters of an inch.



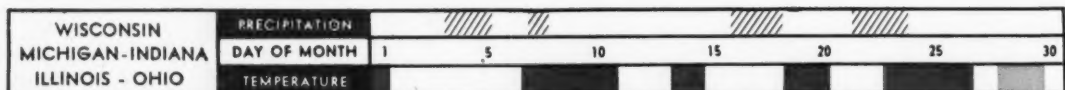
The storminess indicated for a day or two following the 15th should concentrate principally in Utah and Colorado. Look for some northeastern valleys of Colorado to receive minus temperature readings during the cold period indicated around November 18th.



A much colder than normal November is on tap over this three-state area. However, the last week of the month is expected to be relatively mild over most regions. The possibility of additional shower activity is likely around the 9th, 13th, and 27th of the month.







Even though temperatures are expected to average colder than normal over most sectors of this four-state area, November is likely to open and close on a relatively mild note. Look for added scattered shower activity on a day or two around the 13th, 23rd, and 27th.

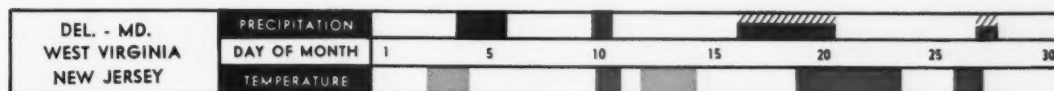


The storminess indicated for a day or two around the 22nd or 23rd should concentrate principally over the southern one half of this area. Although not indicated, southern portions should expect a cloudy, unsettled period around November 10th.

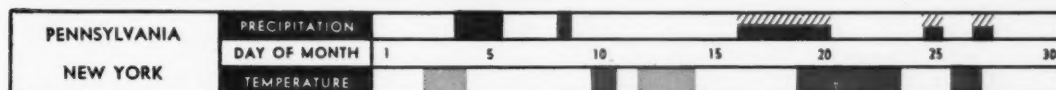
SIGNIFICANT WEATHER EVENTS

RAIN 
 SNOW 
 WARM 
 COLD 

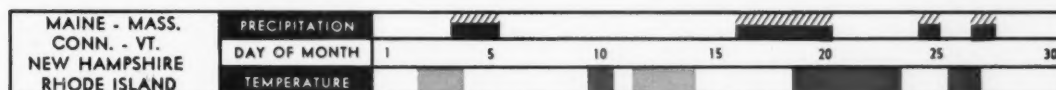
The timing bars below are intended to indicate periods of important general storminess and important departure from temperature normals in areas indicated. They are highly accurate over the area indicated, but are too general to pinpoint small local storminess or showers. Allow one day on either side of indicated storm or extreme temperature periods for general planning. Combination rain or snow shading indicates either one or both.



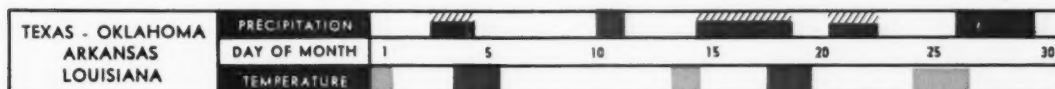
Near normal temperatures accompanied by nearly slightly above normal precipitation is the outlook for November. The showers around the 10th are likely to affect principally southernmost sections. Expect threatening showers around the 8th and the 25th.



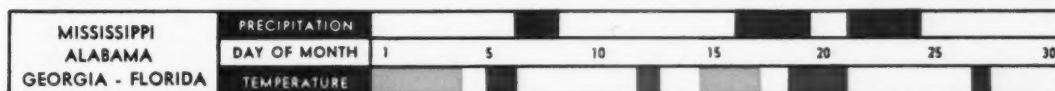
Slightly wetter and warmer than normal conditions are on tap over this two-state area during November. In the Buffalo area look for temperatures to drop to about 8 to 15 degrees during the cold interval indicated for the period from the 19th through the 23rd of the month.



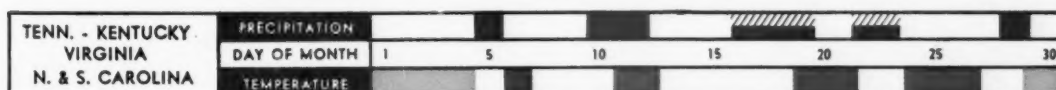
Slightly cooler and much wetter than normal conditions are expected over the New England area during November. The heaviest amounts of precipitation will occur along coastal regions, with the 4th-5th, 17th-20th, and 28th intervals bringing important storminess.



The storminess indicated around the 3rd or 4th of the month should concentrate principally in northernmost sections of Texas and Oklahoma. Southern portions of this area will have considerable cloudiness and frequent precipitation activity during the month.



Look for possible freezing temperatures to reach the Orlando area during the cold period centered around the 20th. Important storminess is expected during the 17th-19th and 22nd-24th intervals. Rainfall totals should range near half the normal over Florida.



The cold spell indicated for a day or two around the 6th should affect principally Virginia and the Carolinas. The month is expected to open and close on a relatively mild note. Freezing temperatures are likely during the cold spells indicated for the last half of the month.

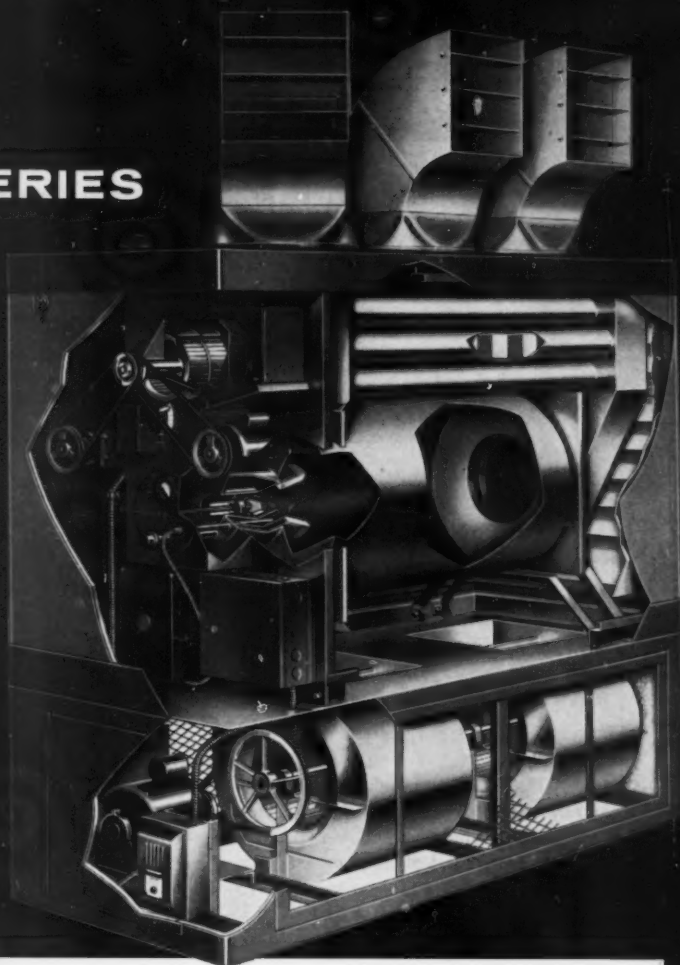
LENNOX "OG" SERIES

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*Operates equally well
with either gas or oil*

Here is a completely new type of power burner obtainable as a straight gas burner, a straight oil burner, or a combination burner for either gas or oil. For the combination burner, gas and oil are introduced at two separate points in the same firing assembly. To change from one fuel to the other, you simply throw a switch and it is unnecessary to make any further adjustments.

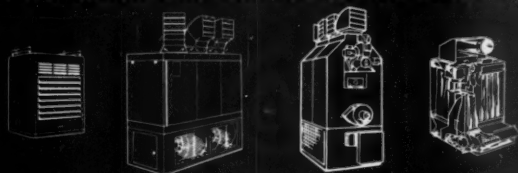
The outstanding performance and common sense construction of these burners is typical of the "OG" Series heater. For the complete story clip and mail the attached coupon today.



Typical Sequence of Combination Burner Operation

- 1 Thermostat calls for heat.
- 2 Combustion air and induced draft blower starts and runs for 25 seconds providing a pre-purge period.
- 3 Pilot is spark ignited and must be proven within five seconds by lead sulfide scanner.
- 4 When pilot is proven, the main gas or oil valve opens.
- 5 There is now a 10-second trial for ignition period which is also monitored by the scanner. Pilot flame is then extinguished.
- 6 If ignition fails, main burner shuts down immediately.
- 7 Main flame is continuously monitored.
- 8 When the thermostat is satisfied, main valve shuts off. Combustion and induced draft blower continues to run for 30 seconds providing a post-purge period.

LENNOX "Task-Matched" Equipment
to condition and control air for industry



64,000 to 2,000,000 Btu Units

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Name

Company

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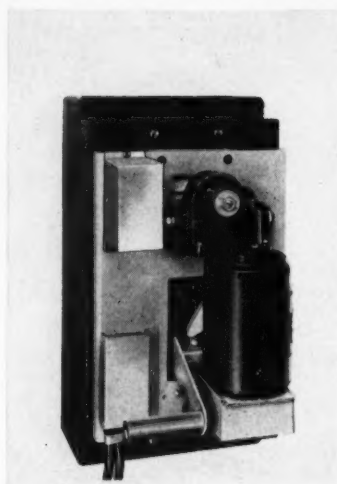
Title.....

TOUGH APPLICATION OR DESIGN PROBLEMS?

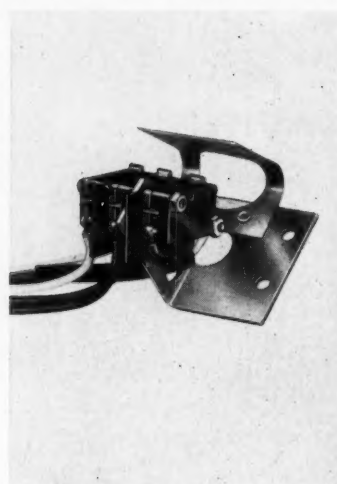
General Electric circuit breaker



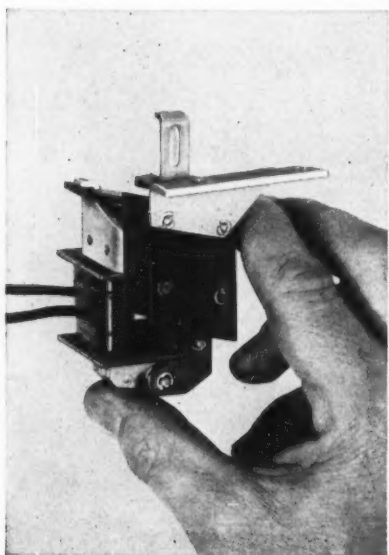
SHUNT TRIP: Opens breaker by remote control, permits pushbutton remote tripping. Used to disconnect power from a remote or centralized point or to interlock with other electrical circuits (AC or DC). Can be actuated by limit switch or relay for automatic feedback control.



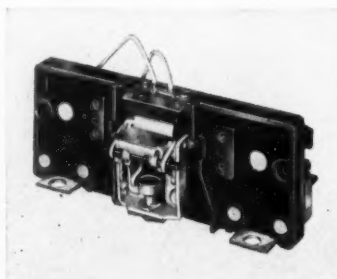
MOTOR-OPERATED MECHANISM: Opens, closes and resets breaker by remote control. Can be used for automatic reclosing or preferred-emergency hook-up by addition of relay. For automated installations, isolated unattended pumping stations, radar systems, etc.



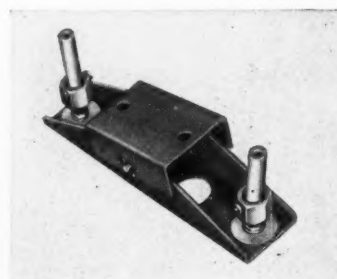
AUXILIARY SWITCH: Operates relay and control circuits at same time as breaker. For remote indication of breaker position (ON or OFF) by means of indicating lights. Can also actuate relays, control related equipment, interlock with other breakers.



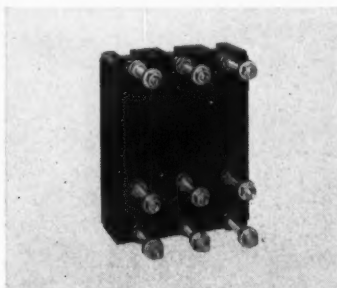
UNDERVOLTAGE RELEASE: Trips instantly when voltage dips. Used to protect motors, elevators, hospital and theatre lights against damage or loss of voltage and to actuate emergency equipment. Voltage must be restored before breaker can be reclosed. No time delay in operation.



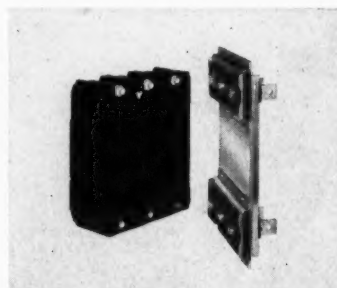
BELL ALARM SWITCH: Signals when breaker trips, protects against unobserved outage, resets automatically.



MECHANICAL INTERLOCK: Prevents two adjacent breakers from being closed in at same time.



CENTER STUDS: Permit use of one breaker and trip unit for double-wound generator or transformer, with full protection.



PLUG-IN SWITCHBOARD MOUNTING BASE ASSEMBLIES: Convert standard G-E breakers to plug-in. May be mounted side by side.

accessories are the answer!

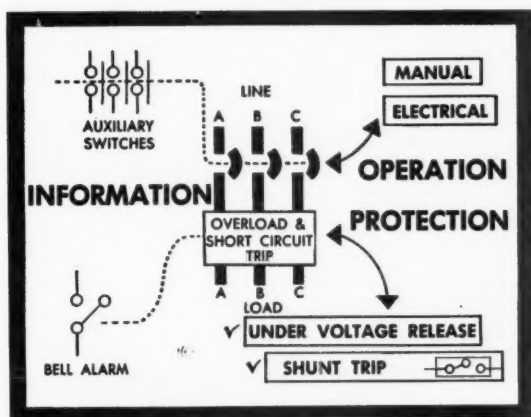
Versatile, convenient, most can be installed in the field

With ever-increasing automation and mechanization, complex control problems need fast solutions — and versatile General Electric circuit breaker accessories cover a wide range of applications to help you solve control problems. They can provide remote closing or opening, lowered voltage protection, overload trip-out indications, automatic reclosing, electrical or mechanical interlocking and primary or sequential operation. (See diagram below.)

For example, if you need to trip a circuit breaker by remote control, the G-E shunt trip is the device you need. It permits push-button remote tripping. In addition to remote control operation, the shunt trip can be used as an electrical interlock with other circuits, either AC or DC. Actuated by a limit switch for automatic feedback control, it is ideal for use in plant safety systems for machine limits, time limits, or any kind of a positive action system.

And you no longer have to wait weeks for delivery of factory-installed accessories. Most General Electric accessories can be field-installed on standard breakers, by your own men, when you need them. Efficient, reliable G-E circuit breakers and accessories answer the growing need for circuit protection, operation and information.

For complete information, see your nearest General Electric distributor, or write Department CBA, General Electric Company, Circuit Protective Devices Department, Plainville, Conn.



PROTECTION, INFORMATION, OPERATION — this example shows how several accessories might work together to give you all 3: Undervoltage device provides low-voltage protection. Auxiliary switch shows you breaker is open. Bell alarm switch tells it has opened on a short or overload. Motor operated mechanism gives you emergency power throw-over or remote operation.

General Electric makes
a complete line of molded-case
circuit breakers and accessories.
10 to 800 amps — 120 to 600 volts
AC, 125 to 250 volts DC.

GENERAL  ELECTRIC

HANDWHEEL

YOKE BUSHING

PACKING CHAMBER

BONNET JOINT

GUIDE RIB

SEAT-DISK JOINT

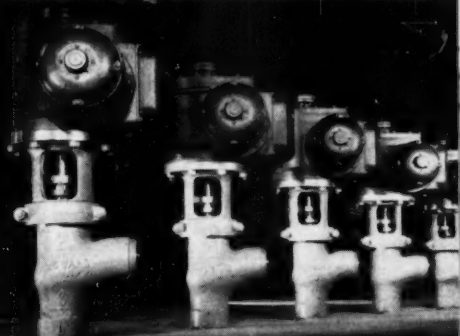
EDWARD CAST STEEL
GLOBE VALVE FIG. 4016 Y



IMPACTOGEAR® OPERATED VALVE



MOTOR OPERATED VALVES



What's New from Edward Valves

New Products . . . Solutions to Problems . . . Information on Steel Valves from Edward, Long-Time Pioneer in the Field!

HOW TO SELECT CAST STEEL VALVES

Valves for today's high-pressure processes require economy, dependability and safety in operation. The material on these pages is designed to help acquaint you with a few basic principles and features you should consider when selecting cast steel valves 2½ inches and larger.

VALVE FEATURES FOR LONGER LIFE, EASIER OPERATION

Valve Handwheel should be large enough to operate valve easily. On smaller valve sizes, a knobbed handwheel design permits tighter grip. But for larger, high-pressure valves, impact-type handwheels will increase closing force, insure tighter closure (see large illustration opposite page). Quick closing can be obtained with impact-type handwheels geared for closing with the aid of portable air or electric wrenches (bottom-left, opposite page). Or, where central or automatic control is desired, consider fixed motor operation (bottom-right, opposite page).

Yoke Bushing on larger valves in higher pressure classes should be equipped with double ball-bearing construction for reduced operating torque and effective transmission of closing load (large illustration on opposite page shows this design). Material is important, too. On smaller valves, bushings of bronze will help prevent stem seizing or galling. Look for ample thread engagement between bushing and yoke and between bushing and stem.

Packing Chamber should be large enough to insure long packing life. Valve packing must allow the stem to move within the bonnet but must not allow any fluid leaks between them. Well made packing, formed specifically for the packing chamber and correctly compounded for your pressure-temperature service conditions, has much to do with satisfactory valve performance. Valves with a positive backseat for re-packing while under pressure offer additional operating advantages.

Bonnet Joint of bolted construction (see Fig. 618 this page) is easiest to work with on medium or small size valves. But for lasting bonnet joint tightness, in high-temperature services (and for reduced size and weight), pressure-seal bonnet joint design is best—no flanges or bolting to periodically restress (see large illustration opposite page). Not all pressure-seal designs are alike, however. Avoid gaskets with small sealing surfaces and sharp edges that can be easily damaged and large threaded gasket loading mechanisms that are hard to disassemble and give unknown gasket compression.

Disk Guiding that properly centers the disk into the seat for positive shut-off regardless of position is important. Valve bodies with integrally cast guide ribs supporting disk throughout travel are best. Avoid designs which attempt to guide by installing spider in seat opening.

Seat-Disk Joint—An integral hard-faced seat is generally regarded as superior to screwed seat construction because it eliminates body-seat leakage and retains hardness under temperature. A hard-faced disk or disk of special alloy is desirable in high temperature services; but 13 per cent chromium stainless steel is an excellent all purpose material below 750° F.

Body Design with streamlined flow passage areas (opposite page) reduces wear-producing turbulence, decreases pressure drop and delivers maximum flow. Valves with streamlined body contours will often permit the use of smaller pipe and valve sizes. Angle valves (see Fig. 7517Y, upper right) have even less pressure drop.

For more detailed information, contact your Edward Representative, or write Edward Valves, Inc., 1210 West 145th Street, East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company. Represented in Canada by Lytle Engineering Specialties, Ltd., 360 Notre Dame Street, W., Montreal 1, Quebec.

Edward Valves builds a complete line of cast steel stop, check, non-return, stop-check and gate valves for pressures to 10,000 lbs. available with flanged or welding ends. Below are illustrated a few of the major valve designs from this complete line.



Fig. 7517Y

Angle stop valve, 1500 lb at 850 F. (3600 lb WOG), with integral Stellite seat, Stellite disk, pressure-seal bonnet, welding ends. 2½" to 14".

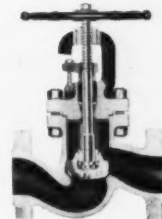


Fig. 618

Globe stop valve, 600 lb at 850 F. (1440 lb WOG), bolted bonnet, flanged ends, integral Stellite seat, Stellite disk. Sizes 2½" to 6".



Fig. 607Y

Angle non-return valve, 600 lb at 850 F. (1400 lb WOG), with pressure-seal bonnet, integral Stellite seat, Stellite disk-piston, welding ends, sizes 8" to 14".

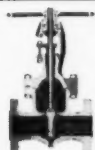


Fig. 611—Gate valve, 600 lb at 850 F. (1440 lb WOG), with hard-surfaced seats and wedge, ball bearing yoke, flanged ends. Sizes 2½" to 12".

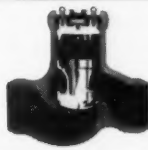


Fig. 4094Y—Horizontal check valve, 900 lb at 850 F. (2160 lb WOG), with integral Stellite seat, Stellite disk-piston, pressure-seal cover, welding ends. Sizes 2½" to 14".



Fig. 7514—Elite-Flow globe stop valve, 1500 lb at 850 F. (3600 lb WOG) or 2500 lb at 850 F. (6000 lb WOG), with extremely low pressure drop and other premium features. Sizes 10" to 18".

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Catalog 14 contains full data on the complete Edward line of forged and cast steel valves from ¼" to 18"; in globe and angle stop, gate, non-return, check, blow-off, stop-check, relief, hydraulic, instrument, gage and special designs; for pressures up to 10,000 lbs. with pressure-seal, bolted, union or welded bonnets, with screwed, welding or flanged ends.

Field Notes

MARJORIE ODEN,
Eastern Editor

Secretary Mueller on Highway Design
... Commissioner Armstrong Agrees



ONE OF THE BEST THINGS that has happened to the consulting engineer in years was the late summer appointment of a new Secretary of Commerce, Frederick H. Mueller, who states that, "It is my philosophy to keep government out of competition with business, and to utilize private enterprise to the fullest."

The first engineer to serve as Secretary of Commerce since the days of Herbert Hoover, Mueller not only is in favor of private enterprise in general — he is a strong advocate of the professional consulting engineer. "It is the policy of both the Department of Commerce and the Bureau of Public Roads, officially and personally, to encourage the use of consulting engineers by the states so long as the state highway departments maintain adequate staffs to properly administer the highway programs assigned to them."

CONSULTING ENGINEER went to Mueller and to the Commissioner of Public Roads, Ellis Armstrong, for an elaboration on these policy statements.

BPR To Maintain Minimum Staff

How large should a highway department staff be? "The Bureau of Public Roads never has expanded its staff beyond the personnel necessary for normal requirements,"

Mueller explained. "All we require is an adequate staff to perform the necessary functions of the Bureau. We should not expand to meet increased design needs of the current Interstate program. It is my own position to keep the staff to a minimum. After all, a department can be expanded in the future if it becomes necessary, but a cutback is more difficult."

Expansion Not Encouraged

What about individual state highway departments? Mueller stressed that the Bureau has no control over administration and policies of the individual states, but "we keep our own staff at a minimum in order to reduce overhead, and we never have encouraged the expansion of state departments. If any individual area thinks it has been encouraged to expand a highway department by the Bureau, then it probably was a misinterpretation of some regional engineer's telling a state it was behind in its highway program — which the department interpreted to mean hiring more personnel in order to catch up."

Mueller and Armstrong agree that the state departments should not expand to handle peak loads. "The government does not hire architects during a busy period, and there is no reason for adding engineers to regular government

payrolls during busy times," Mueller commented.

Armstrong has viewed the highway design picture from positions in both private practice and government. He was an engineer with Uhl, Hall & Rich of Boston and also was in charge of the Utah Highway Department. He recommends the use of consulting engineers by state highway departments not only for peak design load projects but also for projects during more normal times.

CEs For Special Problems

"In the smaller states and urban areas, where a competent group of consulting engineers is available, the consultants should be used for specialized problems," said Armstrong. For instance, he pointed out that small states often do not have staffs experienced in the more intricate design problems required in urban areas.

"In Utah, I liked to use consulting engineers for their fresh approach to the routine. I feel strongly that the consulting engineer has made a notable contribution to the highway departments."

While Armstrong was in Utah, the State Highway Department did about 60 percent of the highway design, with consulting engineers called in about 40 percent of the time. "The percentage of work

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given to consulting engineers varies greatly in different parts of the country. For instance, it has been a long time since the Montana Highway Department used a consulting engineer. Yet in the Eastern states a high proportion of design is done by consultants." Armstrong added that the 40 percent figure is about average for interstate design to date.

"One thing the consulting engineer should remember is that gov-

ernment also has highly competent staff engineers," Armstrong continued. "For instance, California has gathered top talent in the Highway Department. They have had excellent design and also continuity in their highway program."

Long Range Planning Limited

What about long-range planning? Because of rapidly changing conditions of urban and technological developments, Mueller favors a

limitation on future planning. "I am not in favor of long range planning to the extent that technical developments may abrogate these plans. The time factor is such that opinions change rapidly these days, and I do not want to see the government paying for plans it will not use." Mueller stressed that he feels the necessary design talent is available from consulting engineers, and the use of consultants on peak design loads is economically sound.

However, as Armstrong pointed out, long range planning will be used as necessary for continuity in the highway program. "As a professional engineer, I always have felt that consulting engineers have fallen down in getting public understanding of what engineers do," Armstrong added. "There is a general tendency to think of a project in terms of fees paid to consulting engineers and what this is costing the state. The only measure of a highway project should be the end result. And on a difficult project, a consultant can save the state many times the amount of his fee."

Design Cost Figures Misleading

When it was pointed out that consulting engineers would be interested in getting actual design cost figures from the Bureau of Public Roads for comparison purposes (a Hoover Task Force found government design costs as high as 18 percent) Armstrong said, "You can prove anything you want to with figures. I do not see what the consulting engineers could gain by having our cost figures. In Utah, I found the design costs about equal, whether our staff or consultants did the design."

Armstrong said he always is happy to cooperate when possible. However, Bureau records combine design and administrative costs and an accurate separation would be difficult.

As for obtaining data from the individual state highway departments, which do the design engineering for Federal-aid projects,

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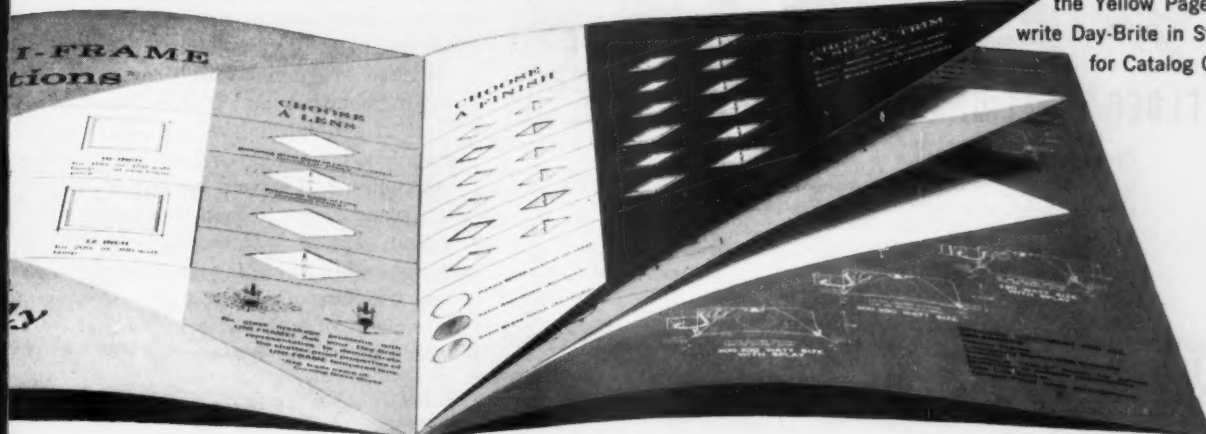


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prospects are getting better. "The Bureau is encouraging state highway departments to adopt more uniform accounting measures. As things now stand, there is no uniform yardstick for comparison among the different states," Armstrong explained. He added that accounting methods in the various states have depended too long on the individual judgments and abilities of their accountants.

The American Association of State Highway Officials also is advocating uniform accounting methods, and included a discussion of this at its Boston convention last month.

Public Relations Important

What would you suggest consulting engineers do as a profession to prevent future expansion of government engineering at the expense of engineers in private practice? Mueller suggested that consulting engineers pay more attention to budget figures in their home states. "After

all, if the budget includes funds for increased government design staffs the most effective way to stop this is to see that your representatives in government do not vote to provide the necessary money," he added.

As for lobby activities, Mueller said he thinks the consulting engineer would do better to put the funds into public education programs. "Public opinion prevails. Enlist the aid of other professional groups, and get the views of the professional men before the public. Work closely with the newspapers and magazines."

Trouble Within Profession

Armstrong, who also is perturbed about the lack of public understanding of the part of the engineer, suggested that the consulting engineer do a better job of policing his peers. "We have had some consulting engineers on highway projects who have given the entire profession a black eye,"

Armstrong said. "Some of these were 'Johnny-come-lately' firms formed to take advantage of the expanded Interstate Program. In some instances, they used highway projects as an opportunity to learn highway design."

Armstrong said a few of the older and larger firms are not doing the profession any good, either. They have expanded to the point where the consulting engineer owners have lost close control over the quality of their work.

The Commissioner stressed that these situations are limited, but that the consulting engineer could do well to develop effective means of self discipline.

Consultants Should Keep Busy

What about the economic future of the consulting engineer? "I do not look for the highway program to be completed before 1970, so the consulting engineers should be busy until then," Mueller said. However, the Secretary cautioned against consulting firms expanding on the basis of the present peak program. This is as uneconomical for the consultant as for government agencies.

A Word of Caution

Mueller offered a word of caution. "There always has been some magic about the government. The tendency on everyone's part is to feel that once they get a government project, this will be followed by another government project. The government does not 'owe' business to anyone."

Armstrong also urged prudence on the part of consultants. "The Interstate Program has been slowed down somewhat, and it may continue at a reduced level for some time. The consulting engineer cannot continue to expand his organization and expect to continue working at capacity." However, Armstrong said consulting engineers who maintain a solid position and a sound professional approach should not suffer. ▲▲

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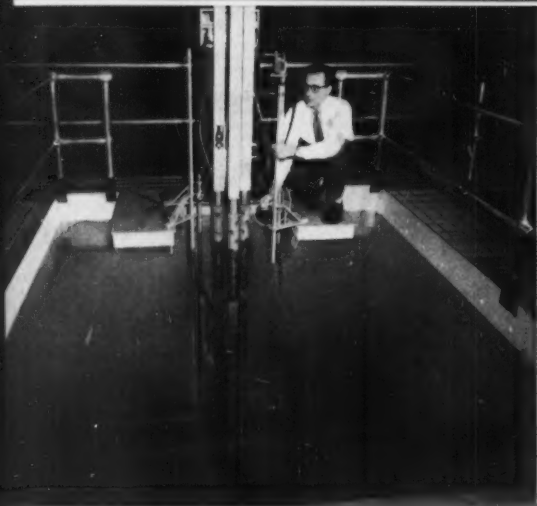
In order to always stay ahead of this trend, A-C has moved to strengthen its position in the swiftly advancing nuclear reactor field. Most recent evidence of this was the acquisition of the reactor engineering organization and reactor business of ACF Industries.

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of nuclear scientists and engineers with a distinguished record of accomplishments in the design and construction of reactors both here and abroad.

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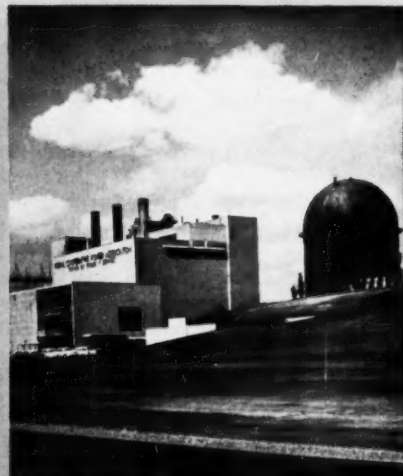
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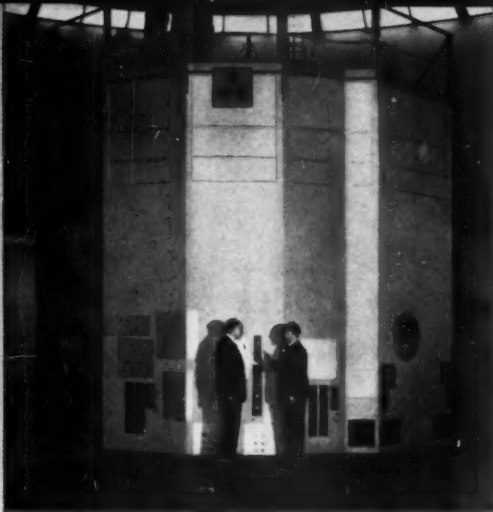
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R-2 (Atomic Energy Company of Stockholm, Sweden). High-flux research reactor for materials testing, fuel development, and nuclear research. Sea water is used as secondary coolant in cooling system. Allis-Chalmers responsibility also includes supervising construction, installation, and start-up of this 30,000 kw reactor.

AF-NETR (Wright-Patterson Air Force Base, Ohio). Water-cooled and moderated reactor designed and being built by A-C. This 10,000 kw reactor incorporates two large, high-flux irradiation-test cells in which high-altitude pressures and other flight conditions can be simulated.

ERR (Elk River Reactor). Built by A-C as prime contractor for the Rural Cooperative Power Association of Elk River, Minn. This 22,000 kw reactor operates with existing RCPA power plant and will produce steam at same temperature and pressure as that from the existing boilers.





CNRN (Italian National Committee for Nuclear Research, Milan, Italy). Heavy-water research reactor used for neutron diffraction, isotope production, and general irradiation experiments. This 5,000 kw reactor is the first to be purchased for use in the Euratom program.



RCN (Reactor Centrum Nederland, Amsterdam). High-flux materials testing and research reactor designed and being built by A-C near Amsterdam. Reactor vessel is immersed in a pool with concrete walls penetrated by numerous experimental facilities. A-C will start up this 20,000 kw reactor, as well as train the operators.

The nine reactors described on these pages have been built...or are now being built... by the Allis-Chalmers staff of reactor specialists.

Training reactors, research reactors, test reactors, and several types of power reactors... these all have contributed to the broad experience in design, development, erection, operation, and maintenance unique with Allis-Chalmers. New developments swiftly influence existing concepts. That's why it is important that you work with people who have versatile experience, a solid record of accomplishment, and

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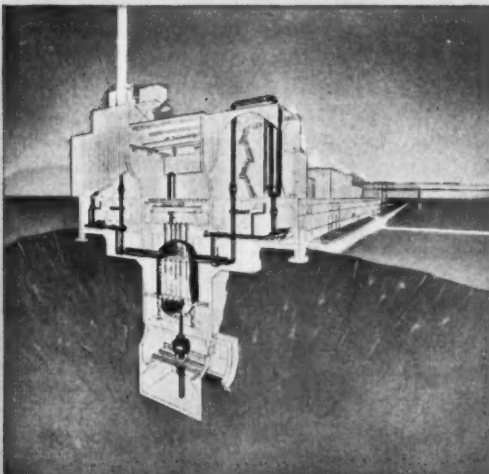
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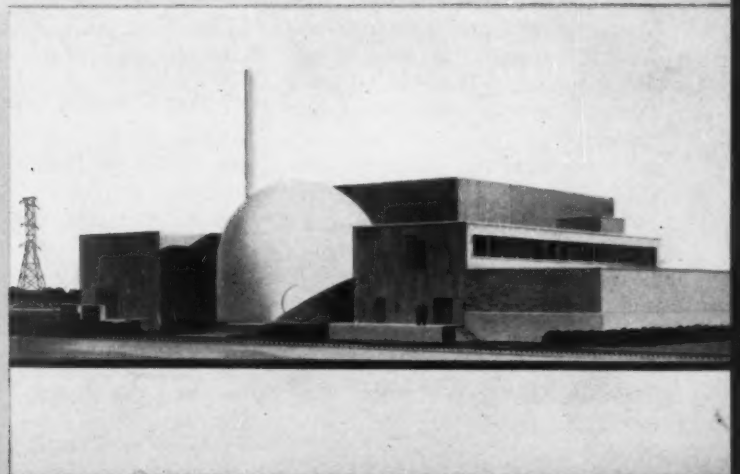


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EGCR (Experimental Gas-Cooled Reactor, USAEC). As subcontractor, A-C completed feasibility and optimization studies of prototype and full-scale power reactors using both natural and enriched uranium fuels. Allis-Chalmers also developed and extended analytic techniques for the physics, thermal characteristics, and fuel-element design of gas-cooled reactors. 85 Mwt, Oak Ridge, Tennessee.



CRBR (Northern States Power Company). This 66,000 kw direct-cycle Controlled Recirculation Boiling-water Reactor (CRBR), with internal nuclear superheat, represents an important advance in reactor technology. To be located near Sioux Falls, S. D., this plant is being designed and built by A-C for Northern States Power Company in cooperation with ten other Midwest electric companies.





The Word From Washington

EDGAR A. POE

Consulting Engineer Correspondent

CONSULTING ENGINEERS around the Nation will be watching developments at the World Bank, Inter-American Bank, and the proposed International Development Association with interest in the months ahead. Congress has authorized increases in the United States subscriptions to the International Monetary Fund and the International Bank for Reconstruction and Development. The Monetary Fund received \$1375 million, the World Bank \$3175 million.

In approving United States membership in a new Inter-American Development Bank, Congress authorized a \$450 million contribution to the billion dollar bank. The Inter-American Bank was created to underwrite accelerated economic development in Central and South American countries. The action was, as President Eisenhower declared, a most significant step forward in this country's economic relations with Latin America.

The International Development Association would be created as an affiliate of the World Bank. Secretary of the Treasury Robert B. Anderson said there was sufficient favorable reaction among World Bank members for the United States to give its approval to such an international agency. It would be financed by various countries and would make long-term, low-

interest loans repayable, either entirely or in part, in local currencies.

AEC Funds

The Atomic Energy Commission, with offices and laboratories scattered from New York to Japan, will have \$2,651,614,000 to spend during the current fiscal year. The Agency, which maintains facilities worth in excess of \$7.5 billion and employs 106,000 people, obtained from Congress nearly all the funds it sought from the 1959 session of the legislature.

Despite the prospects of a thaw in the cold war, there will be no cut-back in the military phase of nuclear weapons during the current fiscal year. Under Chairman John Alex McCone, AEC builds mighty bombs, constructs power plants, delves into the secrets of cancer, operates cyclotrons, probes the depth of the earth, and numerous other things. And McCone knows a lot about engineering. He has built power plants, ships, machinery, and oil refineries.

Pollution Control Limited

Congress, in the final hours of the 1959 session, decided to lay aside the separate House and Senate approved pollution control bills until the 1960 session on the theory that they faced a possible pocket veto by President Eisenhower. The

Chief Executive had recommended to Congress that the \$45 million of matching funds be cut to \$20 million and that the entire program be turned back to the states. Ignoring the recommendation, the House passed a bill that would double the present annual authorization to \$100 million. Subsequently the Senate passed a bill authorizing \$80 million. The two bodies were prepared for a compromise when a decision was reached to put off final action until early next year.

Congress did, however, approve a bill extending for four years the Air Pollution Control Act of 1955, authorizing \$5 million a year for research studies by the Public Health Service into the causes and control of air pollution.

Forand Bill

With premium rates being increased across the country on group and individual hospitalization and medical care plans like Blue Cross and Blue Shield, supporters of the so-called Forand bill will be active in the next session of Congress. Numerous doctors already have testified in connection with the proposed measure.

Under the Forand bill, anyone receiving social security benefits also would receive hospitalization, medicine, and surgery as part of

Side suction,
side discharge

1

Bottom
suction,
top discharge

2

3

Bottom suction,
side discharge

4

Side suction,
top discharge

5

Vertical mounting with barrel supporting motor provides for discharge at either 90° to the suction (shown at lower left) or at 180° to the suction.

6

Mounted vertically, Allis-Chalmers pumps can be driven with motor on another floor — discharge at either 180° to the suction (shown at lower right) or at 90° to the suction.

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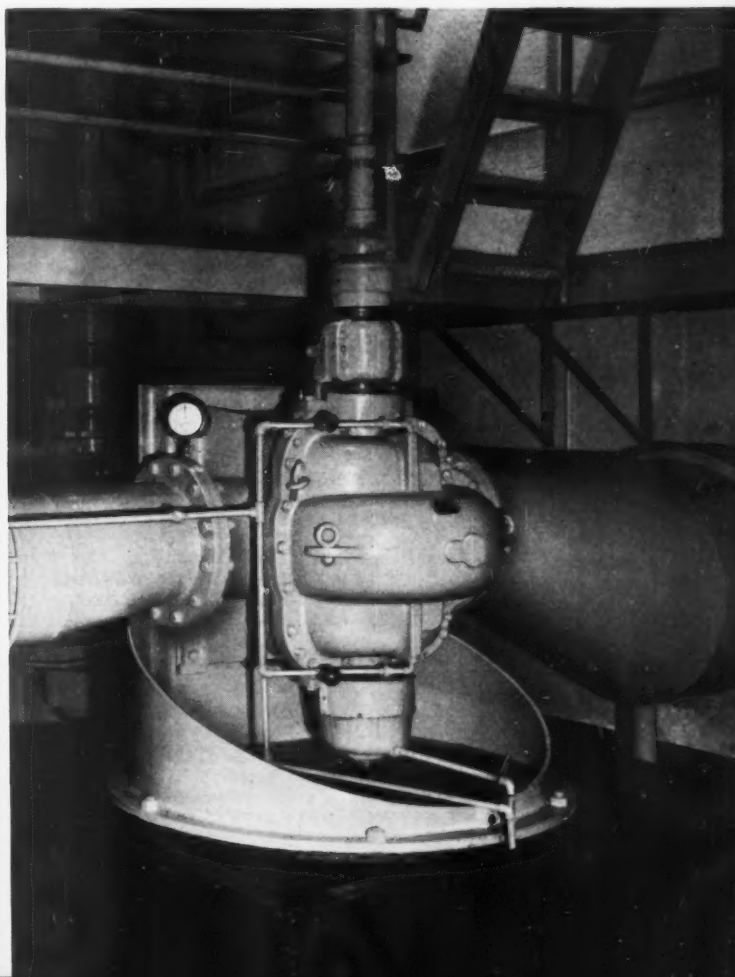
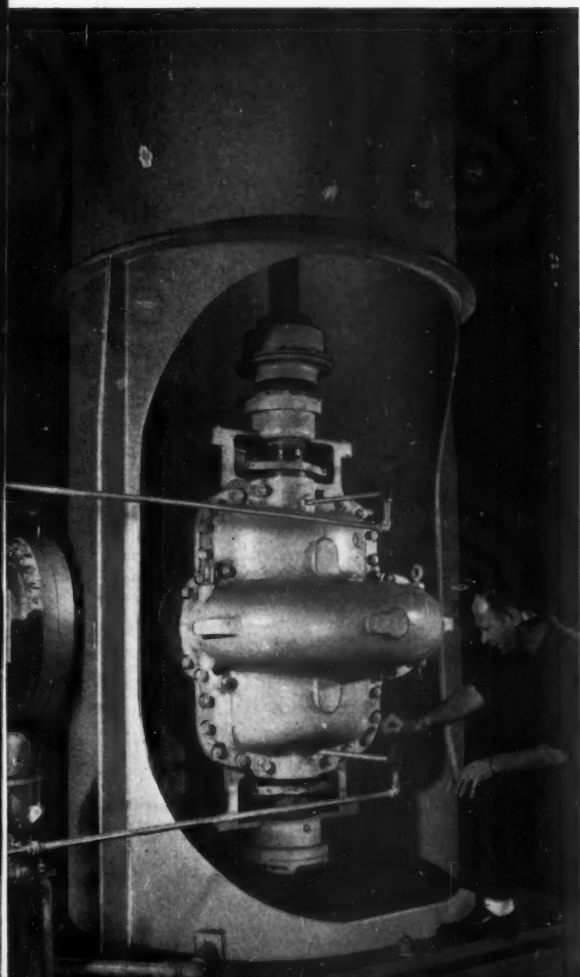
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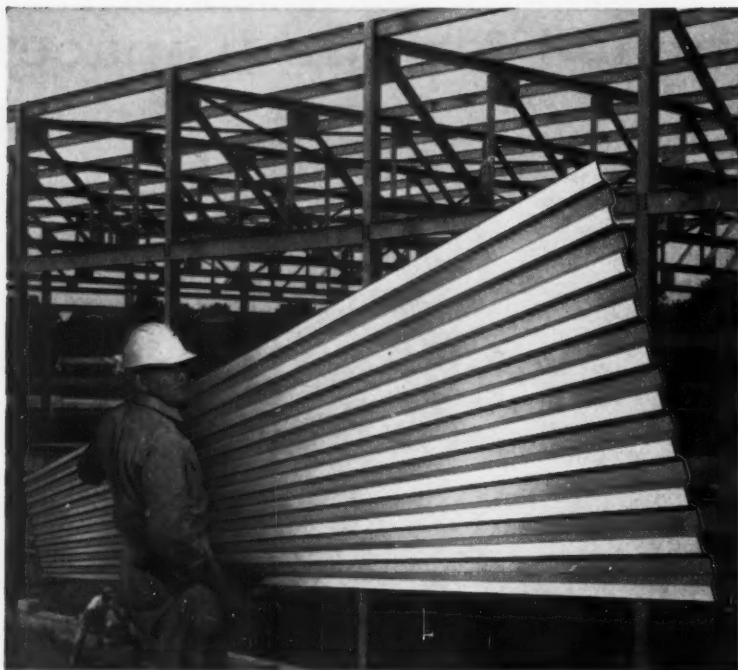
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RD-33R

the program. Proponents argue that only three out of eight persons over 65 have medical insurance of any kind. Opponents contend that insurance plans are adequate, and furthermore many social security beneficiaries might prefer to buy protection other than the hospital and surgical care to be provided, if given the choice.

Obviously any additional social security services will cost money. At this time last year the maximum social security tax was \$94.50 a year. On the first of January it rose to \$120 (maximum) a year. Even if no new social security taxes are added, the tax increase is going to continue to pinch pay envelopes as the increase schedule in maximum figures shows: For 1960-62, \$144; 1963-65, \$168; 1966-68, \$192; and 1969, \$216.

Airport Grants

There was a stalemate between the White House and Capitol Hill on the airport grants question at the 1959 session. President Eisenhower recommended that the Federal government begin what he called an orderly withdrawal from the program by cutting annual matching formula grants from \$63 million to \$35 million. Both the Senate and House proceeded to pass separate bills.

The Senate measure called for five-year extension of the program at \$100 million a year, plus \$65 million emergency fund. However, rather than risk a veto that could not be overridden, the Democratic leaders later compromised on a simple two-year extension of the existing program with grants held at \$63 million a year.

Public Works Program

Consultants are expected to continue to play a substantial role during the 1960 fiscal year in connection with the tremendous public works program to be carried out under the Army Corps of Engineers. A total of \$1,176,579,834 finally was approved for this pro-

THE BIG ONES COME TO BURNHAM



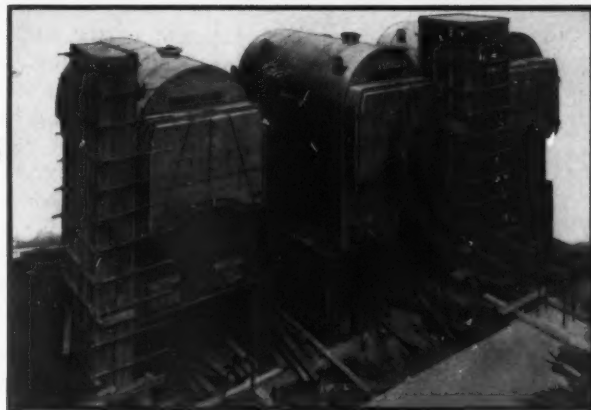
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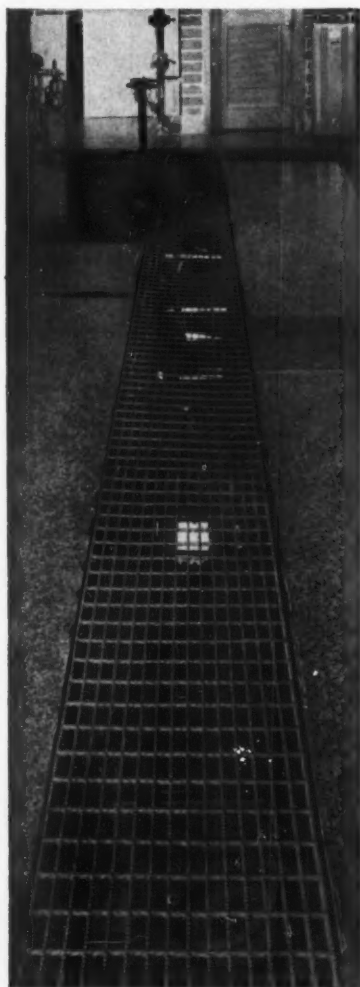
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gram by Congress. Other major appropriations where consulting engineers will be called upon for services are the \$39,228,239,000 for defense; the \$3,225,813,000 for mutual security, plus \$400,905,137 in miscellaneous funds for mutual security; and the \$1,363,961,200 for military construction.

Highway Program

Work on the Interstate Highway System will be cut back \$400 million for the 1961 fiscal year as compared with the record-smashing funds earmarked for fiscal 1960. On the other hand, primary, secondary, and urban highways will have \$925 million of matching funds, a \$25 million increase over the current fiscal year.

The Bureau of Public Roads said that \$1.8 billion will be allocated to the states for the stop-light free, divided, multilaned interstate roads as compared with \$2.2 billion for this fiscal year ending June 30. The Federal government pays 90 percent of the cost of building the interstate highways, but the states must maintain them. The Federal government and each state put up 50 percent of the funds required for primary, secondary, and urban highway construction.

In raising the Federal gasoline tax from 3 to 4 cents a gallon on gasoline and diesel oil, Congress directed that the increased levy remain in force until July 1, 1961. The increased levy will yield a total of nearly \$1 billion in additional revenue.

In another important action concerning the Interstate System, Congress directed the Secretary of Commerce to make a study of the need for the extension of the system in Alaska and Hawaii. A report to Congress, required by January 14, 1960, will include recommendations as to the approximate routes and mileage.

Some other provisions of the 1959 Federal-Aid Highway Act include: authorization for building bridges on Federal dams being in-

creased from \$10 million to \$13 million, and authorizing \$2 million additional for parkways for the 1960 fiscal year.

Tax Funds Earmarked

Beginning July 1, 1961, until July 1, 1964, the Highway Trust Fund will receive 5 percentage points of the Federal excise tax on automobiles and automotive parts and accessories. All of these tax yields now go into the Treasury rather than to the Highway Trust Fund. This earmarking is expected to produce \$802 million in fiscal 1962, \$831 million in fiscal 1962, and \$854 million in fiscal 1964.

Unified Command Sentiment

Sentiment is growing for a unified command on military space and missile development under the Joint Chiefs of Staff. Certainly the confusion, unnecessary secrecy, and inter-service rivalry cannot continue if these separate programs are to progress satisfactorily.

The Navy has proposed establishment of unified development. Certainly the American taxpayers are all for it, because it unquestionably would save a lot of money. To the detriment of the taxpayers, at this time each of the military services has its own development and operations divisions for missiles and satellites.

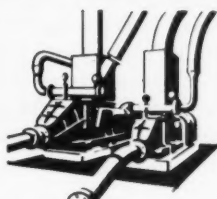
Even laymen can understand that joint efforts by the services would eliminate unnecessary secrecy and advance our lagging missile and satellite programs.

Russian Engineering Graduates

Soviet Premier Nikita S. Khrushchev, during his visit to the United States, boasted on no less than three different occasions that Russia's higher institutions of learning now are turning out nearly three times as many graduate engineers as this country. Before the National Press Club in Washington he said that the Soviet Union last year graduated 106,000 engineers. Before the Economics Club in New

FULLER EQUIPMENT

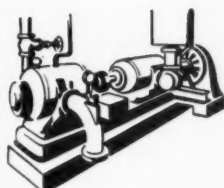
for the process industries



bulk materials pneumatically. Fuller-Kinyon

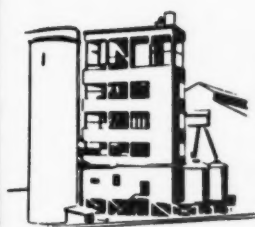
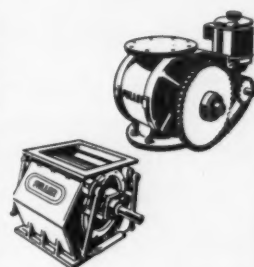
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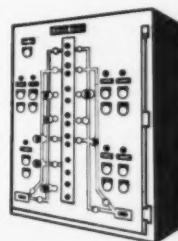
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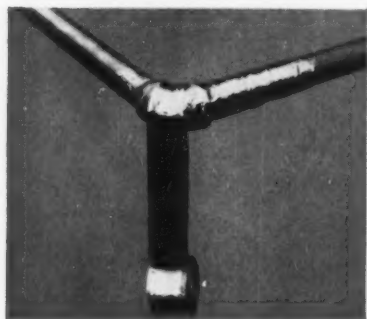
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York and in San Francisco he said the USSR graduated 94,000 engineers compared with 35,000 for the U. S. last year.

Public Power Exercising Influence

The American Public Power Association, representing nearly 1000 publicly owned electric systems, already has unveiled its goals for 1960. The action was spurred by assertedly important public power gains achieved during the 1959 session of Congress.

The Association will use its power and influence against removing tax exemptions on the interest from state and local bonds, and on the income of municipally owned utilities. At the same time it will rally its forces for establishment of a Bonneville Power Corporation (similar to TVA), and for a power line from Bonneville to Northern California; support proposed Federal funds for the longtime projected Passamaquoddy power project in Maine; support acceleration of the Federal government's atomic energy power program; and give its all-out support to measures providing "adequate" appropriations for new and projected power projects.

Among its gains, APPA cited passage of the Tennessee Valley Authority measure permitting it to issue up to \$750 million of additional bonds for expansion of power facilities, appropriations to construct a Federal power plant on the Trinity River in California, and a transmission line to bring Missouri Basin power into Iowa. Still another advance cited was the authorization by Congress for the construction of two atomic power plants, instead of the one plant that had been proposed by the Atomic Energy Commission.

Capital Investment

Capital investment is continuing to expand. The Commerce Department's latest quarterly survey of business fixed investment plans showed that business men intend

to step up outlays for plant and equipment during the final months of this year.

Most major types of construction in 1959 have been running well ahead of 1958. During the first eight months of 1959 the total value of work put in place was 15 percent higher than the corresponding period of 1958. Only a slight part of the increase was attributable to higher construction costs.

IFC Loans

From July 1 to October 1 the International Finance Corporation made six commitments totaling \$5,180,000 for projects in Chile, Colombia, Venezuela, and Peru. These new commitments increase the amount of IFC funds going to 28 projects in 13 countries to a total of \$23,762,000.

The newest loans include \$1.0 million for a proposed cement plant at Huachipato, Chile; \$1.4 million of an estimated \$12.8 million total cost for a plant to produce synthetic ammonia in Peru; \$250,000 to Inresa, a Peruvian company, for expansion of household appliance production; \$280,000 to two Peruvian brick companies for expansion of output to 30 million bricks per year; \$1.0 million to Medellin, a Colombian company, to expand biscuit, cracker, candy, and pastry output to 12,000 tons annually; and \$1.25 million to a Venezuelan company to start the manufacture of refractory products.

Labor Concerned

Labor unions are hot and bothered by passage of the labor reform bill which AFL-CIO President George Meany bitterly denounced as "a fraud upon the American people."

As a result, union leaders are preparing for one of their greatest political battles. In scattered sections, the contests at the polls this year were regarded as preliminary to the big 1960 state and national elections, when labor will make its strongest bid since unionism became big business. ▲▲



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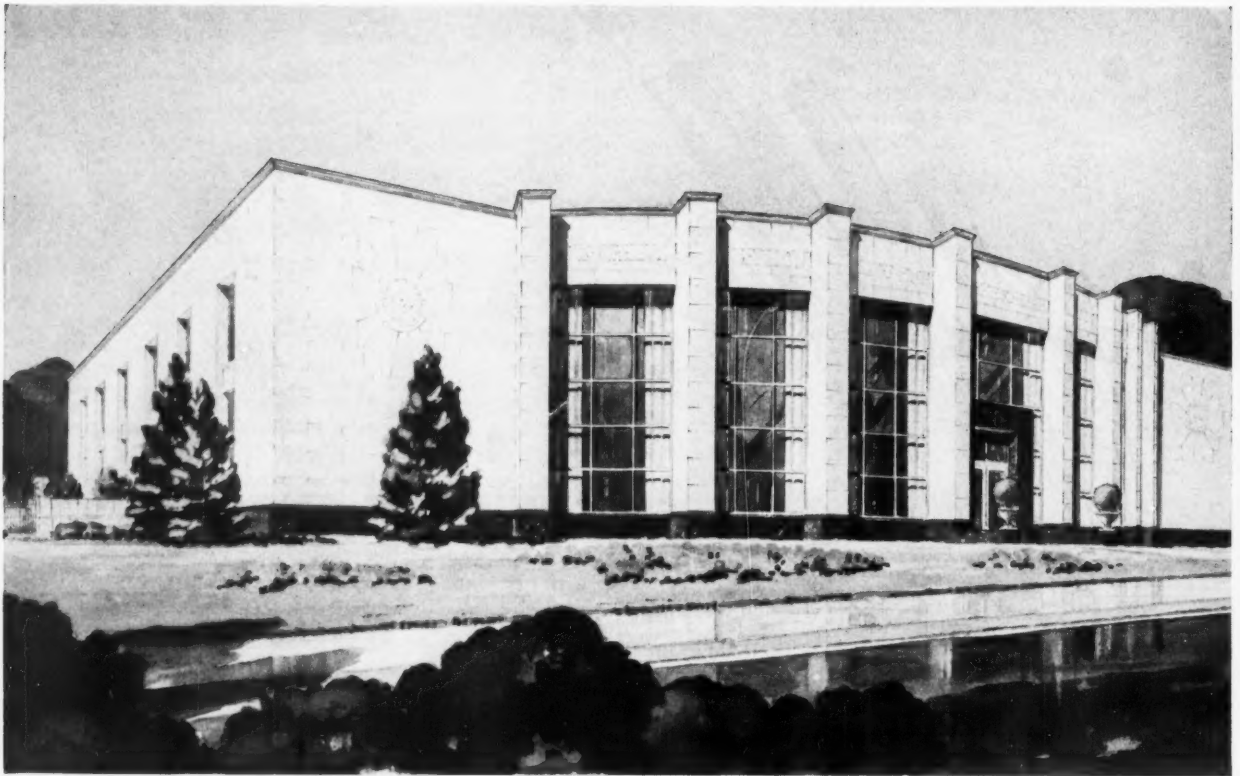
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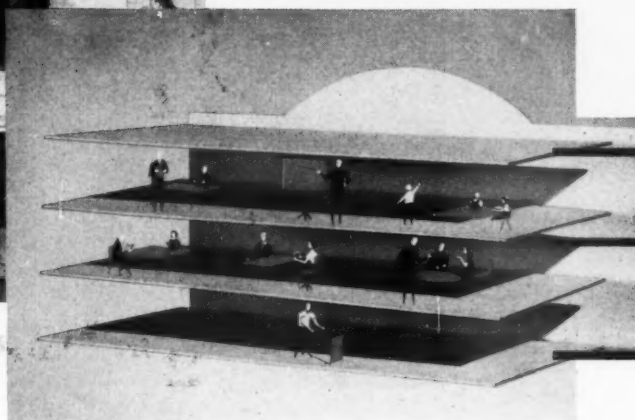
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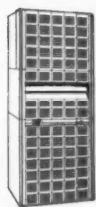
Three Landmarks cover 10,000 sq. ft.—reading rooms, offices, club rooms

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Eight Landmarks cover 21,000 sq. ft.—main reading room, children's library, lecture room, smoking lounge

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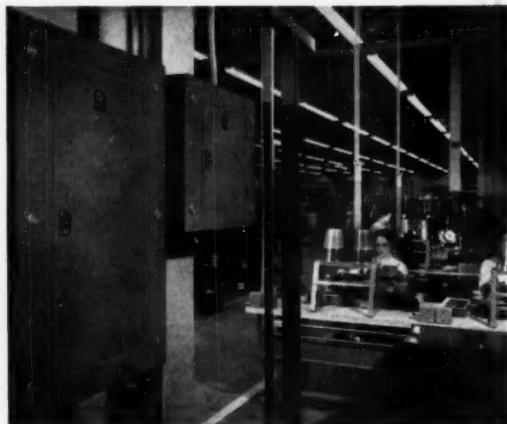
Automatic Electric Company's new plant at Northlake, Illinois, is an outstanding example of more capacity per square foot through straight-line production design. Specifically, production capacity has been increased approximately 100%—and with only 25% more floor space!

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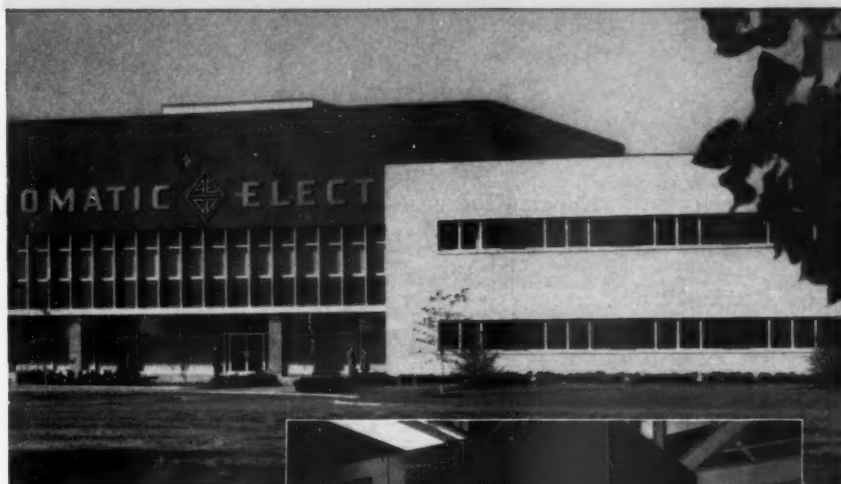
Scientific lighting prevails throughout the factory and office areas. Square D lighting panelboards are used exclusively. Shown above are two of hundreds installed in every part of the plant.



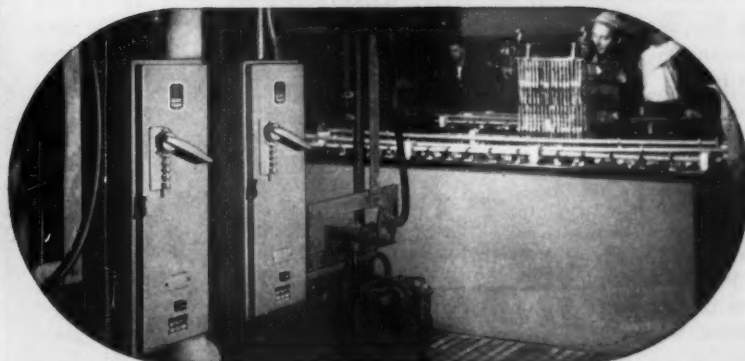
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Atoms in Action

JOHN F. LEE

Broughton Professor and Head
Department of Mechanical Engineering
North Carolina State College

Liquid Fuel Power Reactors

LIQUID FUEL POWER REACTORS have attracted considerable attention and study because of their relative simplicity and promise of lower power costs. The possibility of refueling a reactor on a continuous flow basis is an attractive feature compared with the usual requirement of a shutdown for refueling. However, many technical problems connected with liquid fuel reactors raised some serious questions about the technical feasibility of these reactors. A report of the fluid fuel reactors task force operating under the auspices of AEC now erases many of the technical questions and clearly establishes the liquid fuel reactors as attractive possibilities for power production.

Liquid Fuel Reactor Development

The molten salt reactor (MSR) has the highest probability of achieving technical feasibility. This is due largely to the use of a solution fuel, as contrasted to a slurry fuel in the liquid metal fuel reactor (LMFR) and the aqueous homogeneous reactor (AHR), and the availability of a suitable container material. Summaries of the relative merits of the three concepts are as follows:

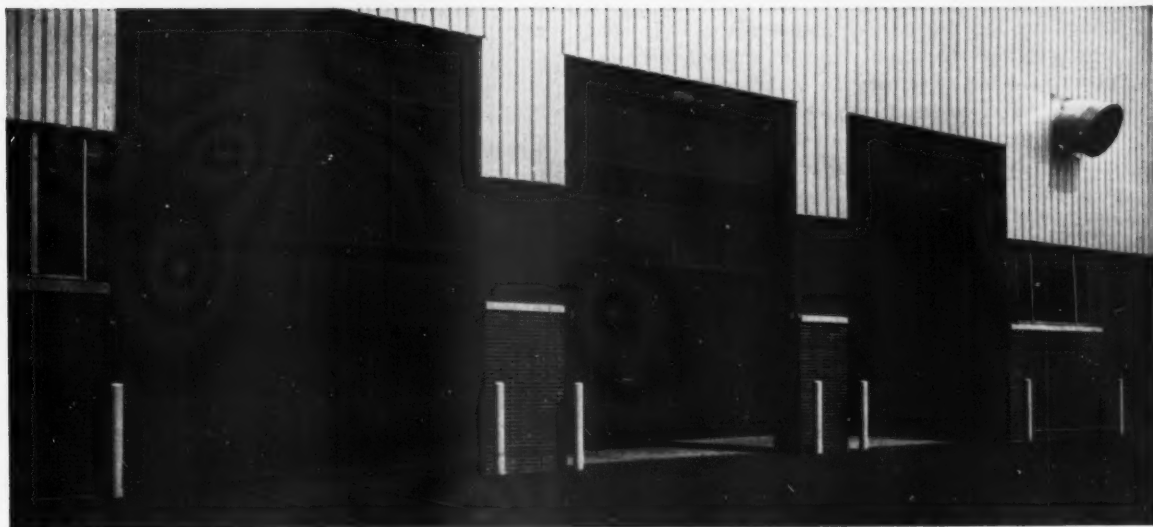
¶ **Technical Feasibility**—At the present state of technology, the MSR has the best possibility of obtaining a satisfactory fuel, if indeed it does not already have a satisfactory fuel. Slurries, as used by the LMFR and AHR, require a greater amount of development effort to establish feasibility. The MSR also offers the best possibility for achieving a satisfactory container material since the LMFR and the AHR have difficult material problems at the present stage of technology. However, the com-

patibility of molten salt fuel with graphite which is contemplated for use in the internal construction of a reactor still remains to be demonstrated, and the problem is judged to be more severe than in the LMFR.

¶ **Satisfactory Primary and Auxiliary Systems**—This depends largely on matters of engineering ingenuity and is believed to be technically feasible. However, these systems will be complicated and hence expensive. In comparing the molten salt with the liquid metal fuel reactor, no significance has been placed on difficulties arising from the molten salt solution's higher melting point (975 F vs. 525 F) and higher top operating temperature (1225 F vs. 1050 F). Difficulties in design caused by the higher temperatures are offset by the fact that the MSR primary system will be smaller than the LMFR system because of the higher volumetric heat capacity of the salt.

¶ **Operation**—It is anticipated that all three reactor concepts can be designed to meet load changes, and it is assumed that they will be able to operate for extended periods of time. However, this has not yet been demonstrated. When considered from the standpoint of reliability for extended periods of time, the AHR is at a disadvantage because of its more extensive and complex auxiliary systems.

¶ **Maintenance**—This is the most important factor influencing the practicability of any of the three concepts. At present the feasibility of maintaining a large fluid fuel reactor power station is doubtful because of the need for circulating a high-level radioactive, fluid fuel stream. While experience with the HRE-2 has shown that it can be main-

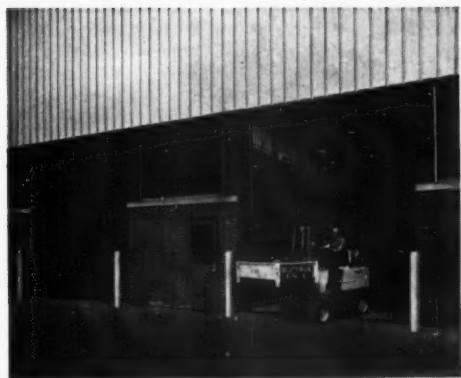


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tained by the use of wet maintenance, it is not known if these techniques can be applied to large plants. The use of remote dry maintenance for any of the plants is unproven. The feasibility of any maintenance scheme can be established only by a comprehensive design study backed up by extensive full-scale mockup testing under conditions simulating actual requirements.

¶ **Control**—The AHR is easily controlled, as has been indicated by reactor experience. Analytical studies show that the MSR and LMFR can be controlled, but this requires experimental verification. Both may require shim rods.

¶ **Safety**—The AHR is potentially the most hazardous because of its high pressure system, radiolytic gas explosion hazard, and the potential instability of the fuel. However, HRE-2 has operated for a long period of time under very disadvantageous circumstances without serious release of radioactivity. The MSR and LMFR are similar to each other in their safety characteristics.

Power Costs

The following cost tabulation summary was prepared to provide a basis for evaluating the relative power cost potentialities and indicated level of investments in the molten salt, liquid metal fuel, and aqueous homogeneous reactor concepts for large

central power stations (reactors, 333 MWE gross).

	Mill/kwh		
	LMFR	MSR	AHR ^c
Power plant investment	5.72	6.24	6.70
Chemical & waste disposal plant investment	0.71	0.71	0.89
Fuel inventory use & burnup	1.36	1.37	0.90
Chemical plant operation & maintenance	0.76	0.76	0.96
Power plant operation & maintenance	1.46	1.57	1.63
Total Power Costs — Gross	10.0	10.7	11.1
Total Power Costs — Net	10.7	11.1	11.5

The Molten Salt Reactor

The Molten Salt Reactors utilize molten fluoride salts as the solvents for both the fuel and the fertile material. The fluoride salts themselves have about half the slowing down power of graphite, and so reactors may be homogeneous with only self moderation by the salt, or may use graphite as the primary moderator. The container material, a nickel-molybdenum alloy, is compatible with both the salt and graphite. A large variety of reactor types can be constructed using these basic materials.

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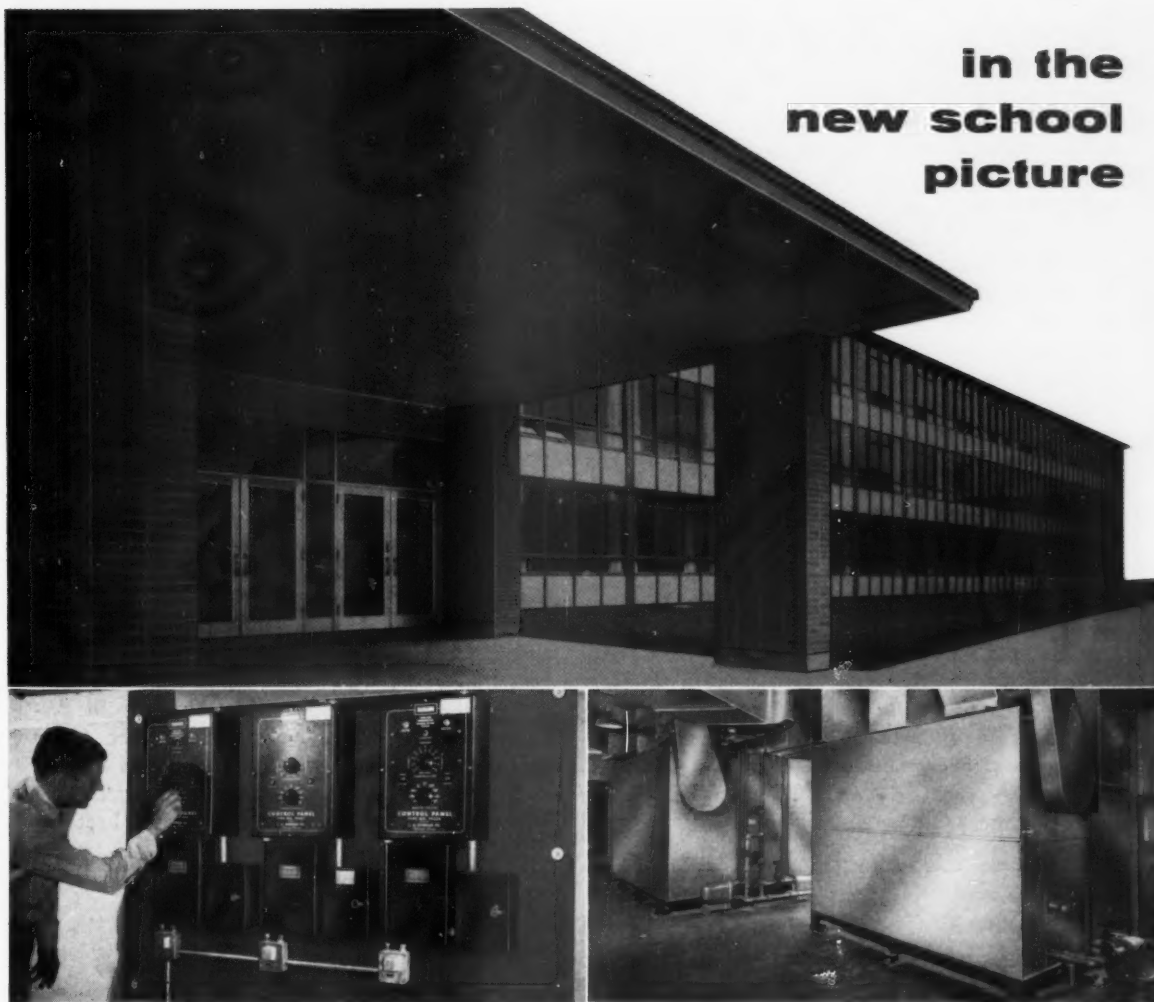


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as the fertile material and U-235 as the added fuel is being given primary consideration. U-238 can be used as a fertile material in the same reactor at slightly higher power costs. Another reactor type given considerable study is a two-region, externally cooled homogeneous reactor. This reactor type avoids the complication of a graphite moderator, but has a lower conversion ratio and consequently a slightly higher fuel cycle cost.

Three types of molten salt reactors are considered for breeding. In order of increasing difficulty of construction, they are the two-region, externally cooled homogeneous reactor, the one-region, externally cooled, graphite moderated reactor, and the two-region, externally cooled, graphite moderated reactor. The first of these, relatively easy to construct, will just barely breed, as will the one-region, graphite moderated reactor. The two-region, graphite moderated reactor is better as a breeder but has a doubling time of about 40 years.

Special Merits

The molten salt reactor is the only one of the three fluid fuel reactors that does not require a slurry. The use of solutions for both fuel and fertile material simplifies mechanical design, avoids erosion problems, simplifies some steps in chemical processing, reduces concern over nuclear instabilities, avoids settling or drainage problems that may oc-

cur when a fuel pump stops, and decreases the required development work by a large factor.

Corrosion is not a problem in the molten salt reactor system for temperatures up to 1300 F. The basic mechanism of the corrosion that does occur at higher temperatures is well understood; the stability of the INOR-8 alloy to fluoride salts does not depend on a surface film or on additives. The state of the materials and basic component development program is such that a design and development program for an experimental reactor could be inaugurated at once. The ultimate economic potential of the system can be properly appraised within a 10-year period, so that this reactor, if successful, would join the class of reactors "achieving economic power within 10 years" as defined by the Ad Hoc Committee.

The wide range of solubility of U, Th, and Pu in the fluoride salts and the low thermal neutron cross-section of the Li7, Be, and F atoms used in the salts makes them versatile for a variety of reactors. The fluoride salts (mixtures of LiF, BeF₂, and fissionable and fertile fluorides) are excellent heat transfer agents. The volumetric heat capacity is high, tending to yield compact heat transfer systems. The high reactor mean temperature (1150 F) allows greater temperature differences in heat exchangers and thus smaller heat exchangers. The low pressure of the liquid fuel reduces heat ex-



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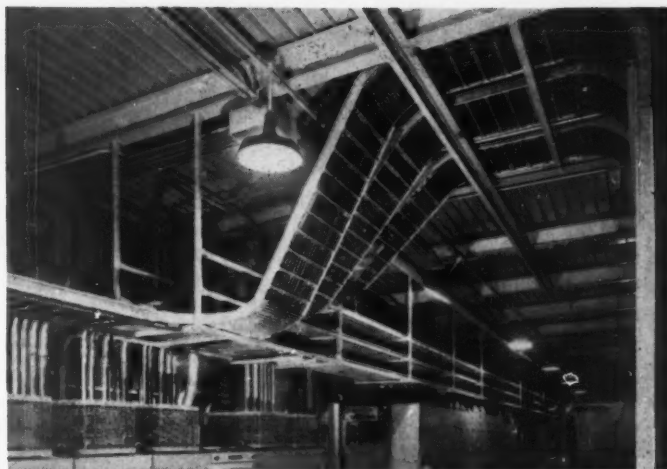
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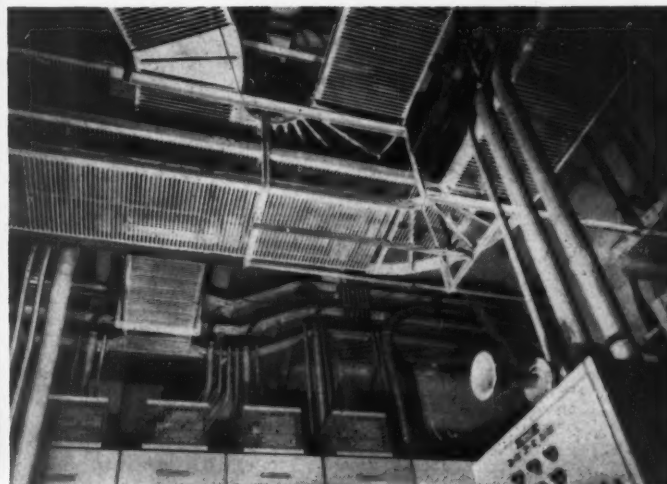
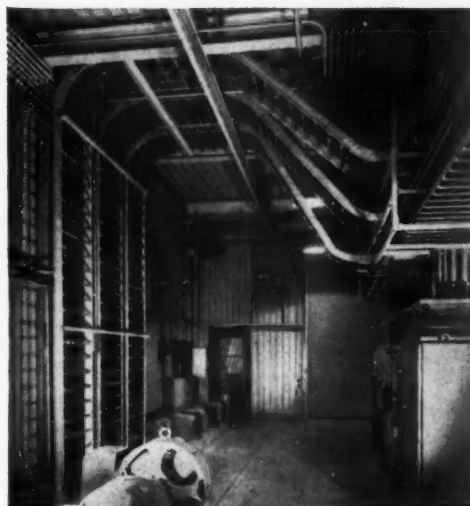
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Globe's two types of cable trays, one a ladder type and the other a basket type, to support cables, wiring and tubing have become increasingly popular because they can be used **INTERCHANGEABLY** at any given location depending on the type and weight of the cables to be suspended. The advantages of each type tray can be used to the fullest. Globetrays, the ladder type, is intended for use where festooning is not a problem, while Cable-Strut, the basket type, is used for the support of communication wire, instrument tubing and control cables in automation applications.

These two cable trays have been thoroughly field tested in hundreds of large industrial installations, in new plant construction, in power plants and for power distribution in all types of manufacturing processes. Send for **FREE** catalog giving full information and installation techniques.

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changer header thickness, pipe wall thickness, and reactor vessel wall thickness over the aqueous reactor. These factors tend to reduce the difficulty of maintenance. The low pressure also reduces the volume required within the secondary containment vessel and should simplify plant construction.

The high melting point of the fuel is an advantage from the point of view that in case of a spill of fuel it will tend to solidify into a relatively water insoluble solid, thus tending to prevent spread of fission product contamination.

Limitations

The high melting point of the fuel salt requires equipment for preheating the system to the reactor temperature. It also requires control of the coolant temperature so that it does not freeze the fuel in the heat exchanger. Sodium reacts with the fuel to precipitate uranium. If sodium is used as a primary coolant, the fuel salt must be pressurized with respect to the sodium so that any fuel leaks will be in that direction. Oxygen in excess of limited amounts will react with the fuel to precipitate uranium, so that the fuel system must be buffered to prevent contamination by air or moisture. The maximum conversion ratio and minimum doubling time are dictated by those attainable in a graphite moderated system. These are not as good as those

obtained in the aqueous homogeneous reactor. The alloy used for construction and the high purity fuel salts with their Li^+ content are expensive.

Proposed Fuel System

The fuel salt has an initial composition of 0.3 mole % UF_4 , 13 mole % ThF_4 , 16 mole % BeF_2 and 70.7 mole % LiF . There are 900 cubic feet of fuel salt in the system, and the initial inventories are 829 kg of Li^+ . The fuel salt is withdrawn from the reactor primary circuit at a rate equivalent to 20 percent of the fuel inventory per year and placed in 150-day hold-up tanks to await chemical processing. As the fuel is withdrawn it is replaced with fresh fuel of the original composition except that the UF_4 content is adjusted to keep the reactor critical. The uranium additions would comprise all of the mixed U-233 and U-235 recovered from the chemical plant plus fresh highly enriched U-235.

The equilibrium inventories of uranium isotopes in the reactor primary system are 510 kg of U-233 and 430 kg of U-235. The average conversion ratio is 0.67, so 92.5 kg of U-235 per year must be added. Thorium is burned at a rate of 188 kg per year.


The above fuel solution would operate at a reactor inlet temperature of 1075 F and an outlet temperature of 1225 F (580 C and 663 C). The liquidus temperature for this system is 524 C, the first solid precipitating being 3 $\text{LiF} \cdot \text{ThF}_4$. If the composition were changed by addition or removal of one constituent at 500 C, the limits outside of which precipitation would occur are: ThF_4 , 8-21 mole %; BeF_2 , 11-40 mole %; LiF 53-74 mole %.

No complications occur from heating. The solubilities of alkali fluorides and alkaline earth fluorides are quite high. Trivalent fluorides, like those of plutonium, uranium, and the rare earths will co-precipitate when the total concentration exceeds a critical limit. The solubility of rare earth fluorides has not been measured in this particular salt composition, but from measurements on a similar system (70 LiF - 10 BeF_2 - 20 UF_4), the solubility at 565 C is estimated to be 1.0%, or sufficient to accommodate the 0.4 mole % of rare earth fission products that would build up during a nine-year fuel life. Certain heavy metal fission products, such as Mo, Ru, and Nb perhaps form as elemental metals on the walls of the system. Heat or other effects from these might be a considerable problem. The total quantities of the three formed in nine year's operation is estimated to be about 430 kg. If uniformly distributed, with a density of 7 g/cc, a layer of about 1 mill thickness would form.

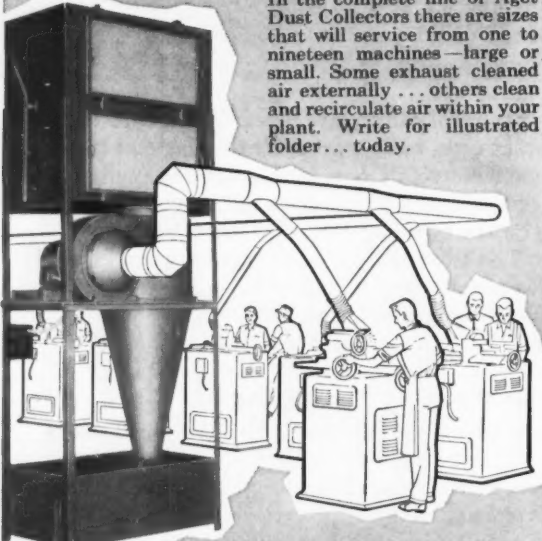
An alternate fuel consists of 20 mole % UF_4 (1.3% enrichment), 10 mole % BeF_2 , 70 mole % LiF . The liquidus temperature for this system is 500 C, the first solid precipitating being 7 $\text{LiF} \cdot \text{UF}_4$. ▲▲

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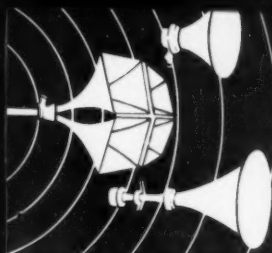
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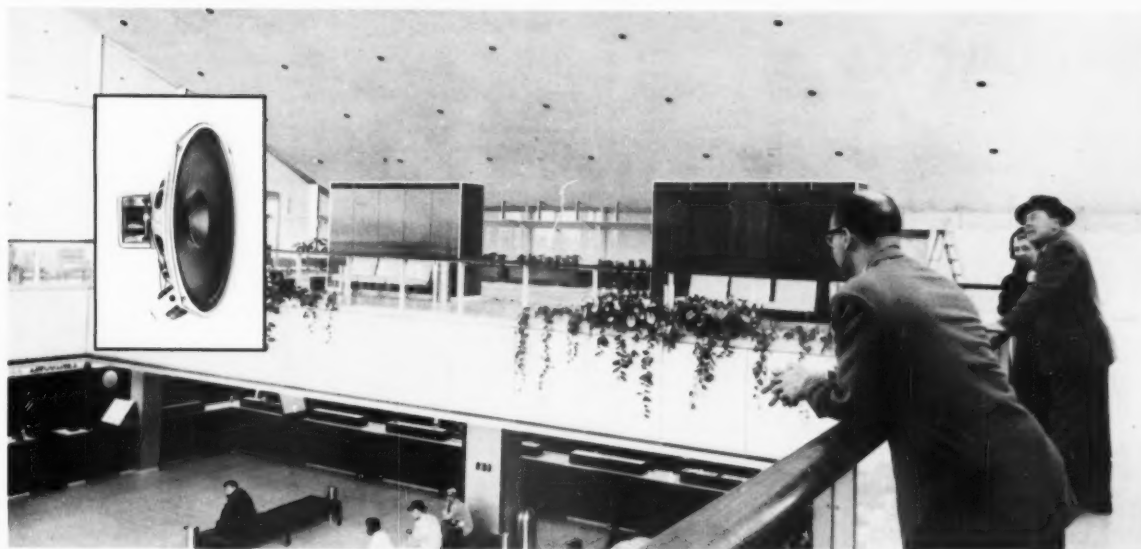


AUDIO NEWS

for consulting engineers

HIGHLY SELECTIVE PAGING AT NEW YORK INTERNATIONAL ARRIVAL BUILDING

Controlled announcements . . . continuous Hi-Fi Music . . . Emergency overrides



In keeping with the rapidly advancing jet age, the International Arrival Building at New York International Airport combines modern decor and spaciousness with the latest facilities for handling mushrooming numbers of overseas air travelers.

Pinpoint control over passenger movement and terminal operations—a vital factor in this building longer than 11 city blocks—is accomplished by an extensive but carefully integrated sound system which is operated from a central console. Selective paging is provided to 53 separate zones in the building from the console. Programmed background music which plays continuously is interrupted only in the zones being paged.

Local microphones, in customs and spectator decks, utilize part of the central power bank for local amplification without interrupting other areas. For emergencies, microphones located in police booths, ramp controller stations and in the terminal superintendent's office can override the entire system, no matter what the switch positions on the central console may be at the time.

Separate low-power sound systems are used by indi-

vidual airlines for local announcements in their area. These systems override the background music while paging, but in the event of an emergency, full power is given to the central sound system to override background music or local paging.

The power bank consists of seventeen 70 watt amplifiers which are rack-mounted for accessibility.

More than 650 RCA Duplex Loudspeakers are used in the system. They are mounted behind perforated metal pan ceiling panels and flush grills which blend inobtrusively with the building styling. These permanent magnet type, 8-inch, high fidelity speakers were selected because of their excellent response characteristics, sensitivity, and low cost. They provide high quality reproduction of voice or music and are recommended where low or moderate noise levels prevail.

A convenient fold-out brochure permits quick comparison of specifications for 24 other RCA loudspeakers. Ask for the Loudspeaker Select-a-Guide Form 3R3509.

RCA Sound Distributor—Commercial Radio-Sound Corp., New York City

THE ILLUSION OF AN ACOUSTICALLY PERFECT AUDITORIUM



A recent project at the David Sarnoff Research Center was the creation of an acoustically "perfect" auditorium—part of RCA's never-ending efforts to develop and refine advanced sound reinforcement applications.

Specifications called for a completely concealed, low-level sound reinforcing system that would provide sound pick-up over the entire stage area and distribution of amplified sound in the audience area without listeners ever being aware of sound reinforcement.

The problem was approached by designing both auditorium and sound system as an integrated unit. Hence, carpeting, wall construction, materials and wall inclinations were all chosen to give optimum results.

Six RCA BK-10 Bigradient Uniaxial Microphones were concealed behind perforated acoustic tile in the ceiling of the stage. As a result, a speaker's voice can be picked up anywhere over the stage area of 600 square feet.

Twenty RCA SL-12 loudspeakers, each mounted behind square foot sections of perforated metal ceiling surface, were strategically placed to give full coverage to the 2000 square feet of auditorium space. Each covers approximately 80 square feet of active listening area and gives smooth response over frequency range of 50-15,000 cycles.

To create the illusion of sound coming from the stage rather than from overhead loudspeakers, an acoustic delay system was installed. The 20 loudspeakers were divided into three banks, and delays of 40 and 60 milliseconds introduced to the banks of loudspeakers farthest from the stage.

The illusion works perfectly. A lecturer or speaker is free to walk about the stage, assured that his voice will be picked up from any spot with no appreciable variation in level or quality. To members of the audience, the delay system creates the illusion that the speaker's voice is coming from the stage. The illusion is further enhanced by the apparent absence of microphones and loudspeakers.

For more information about this application, ask for booklet entitled, "How the Illusion of an Acoustically Perfect Auditorium is Created."

Designed by Dr. Harry F. Olson, Director of RCA Acoustical and Electromechanical Laboratory.



NEW MINIATURE DYNAMIC MICROPHONE IDEAL FOR STAGE AND PUBLIC ADDRESS APPLICATIONS

Ruggedly designed for informal use, this tiny BK-6B microphone ($2\frac{9}{16}$ " long; $1\frac{5}{16}$ " in diameter) may be worn around the neck on a lanyard, easily concealed in a man's hand, or hidden on a set. Its appearance is pleasing when exposed to direct view but can blend readily with stage props.

The BK-6B is most effective when suspended from the neck. Resting against the chest, it picks up low-pitched sounds. Since it points toward the speaker's mouth, it is highly sensitive to the sibilant sounds that otherwise might be lost. Its light weight (2.3 oz.) and flexible cable allow free unhindered movement.

Engineered to complement human speech, frequency response of the BK-6B is from 80 to 12,000 cycles. A special internal acoustic resonator is used to support the response to lower frequencies. A damped resonator in front of the diaphragm reduces a high-frequency emphasis while extending the upper frequency limit. Effective output at 1000 cps is -67 dbm, referred to a sound pressure of 10d/cm².

Ask for Catalog sheet S.265 for complete specifications and for "Microphone-Select-A-Guide" which includes illustrations, specifications and application data on 15 microphones for your comparison.

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In addition to intensive product development and research conducted by the RCA Sound Products Group, the sound line benefits from continuous audio and acoustic research projects in RCA's Broadcasting, Sound Recording, Defense, and Home Instruments Divisions.

For technical information, write to Sound Products, Dept. T-302, RCA, Camden 2, New Jersey, or ask your Sound Distributor. He's in the Classified Directory under "Public Address and Sound Systems." Either way, there's no obligation.



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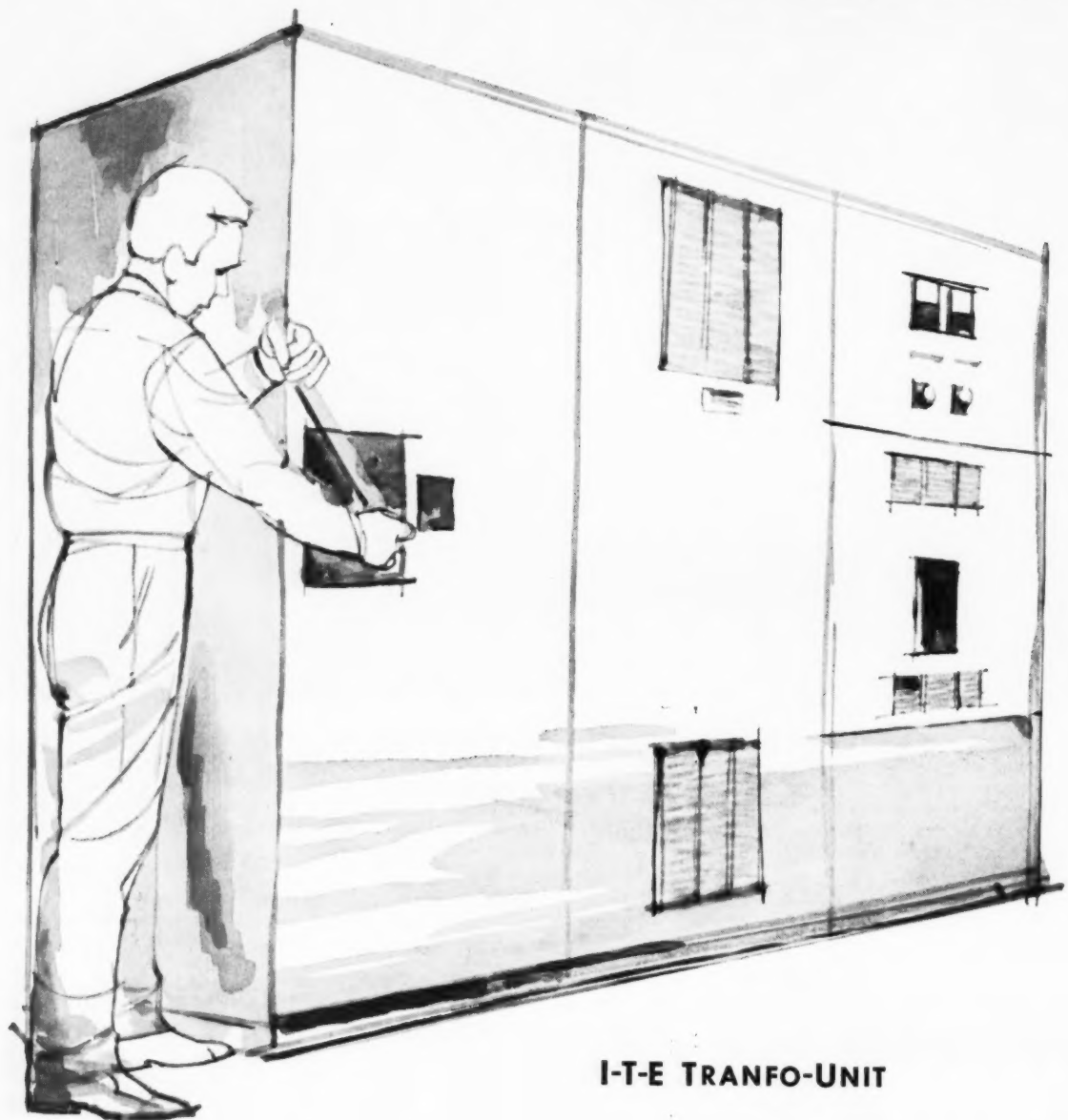
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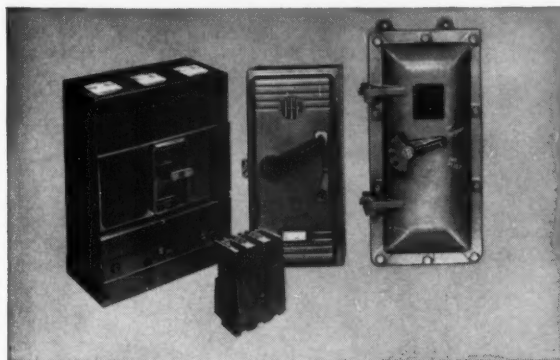
NEAT



I-T-E TRANFO-UNIT

Believe it or not, the I-T-E TRANFO-UNIT illustrated at left is a *complete secondary unit substation*. It combines in one package the primary switch, transformer and secondary circuit breakers. And it costs no more than hodgepodge arrangements of assorted gear.

The TRANFO-UNIT is ideal for bringing high voltage power right up to load areas in industrial plants or for incoming power in many commercial buildings. Because it's completely self-contained, it's safe without a fence. It saves floor space.



First choice with electrical equipment manufacturers. A generally acknowledged fact about I-T-E molded case circuit breakers is their popularity with electrical equipment manufacturers. This important group of circuit breaker specifiers consistently chooses I-T-E *more than any other brand*. There are several reasons. I-T-E offers the broadest line. Extra quality in numerous engineering and construction details actually costs you no more. And experience proves that it pays off in superior performance. Installation is particularly easy. Enclosures are available for individual breakers in a wide variety of indoor and outdoor types.

And it gives a neat, clean appearance so important in modern buildings. Delivered complete, the TRANFO-UNIT simplifies ordering and reduces cost of installation. Available in ratings up to 3000 kva.

All of the major components of the TRANFO-UNIT are products of I-T-E. Marrying them together is the result of I-T-E engineering skill . . . and of our constant effort to offer you greater value in everything that bears the I-T-E name. Why not make us prove just how sincerely we can say this?



High speed d-c protection. A fault on d-c circuits involving electrolytic processes can in most cases produce runaway currents. But I-T-E Model FB d-c circuit breakers interrupt fault currents before they get into the danger area. Interruption occurs in roughly 12 milliseconds. Currents with rate of rise of even 15 million amperes per second are stopped at an approximate peak of 60,000 amperes. This means extra protection for all associated equipment from the damage that could result from even momentary persistence of such high currents. FB circuit breakers are available in either single or double pole. Compact. Easy to install.



Safe passage for bus conductor. I-T-E metal-enclosed bus is completely protected from the hazards of dirt and weather . . . and from the normal risks of accidental damage. Unlike cable, it endures the sieges of time without wear or insulation loss. Ideal for linking transformer to switchgear, for connecting switchgear assemblies, and for channeling large amounts of power through factories and office buildings, I-T-E nonsegregated phase bus never needs attention. At the same time it can be easily tapped into at a later date. Because it is delivered prefabricated from I-T-E, installation is easy and performance is assured.

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P-2

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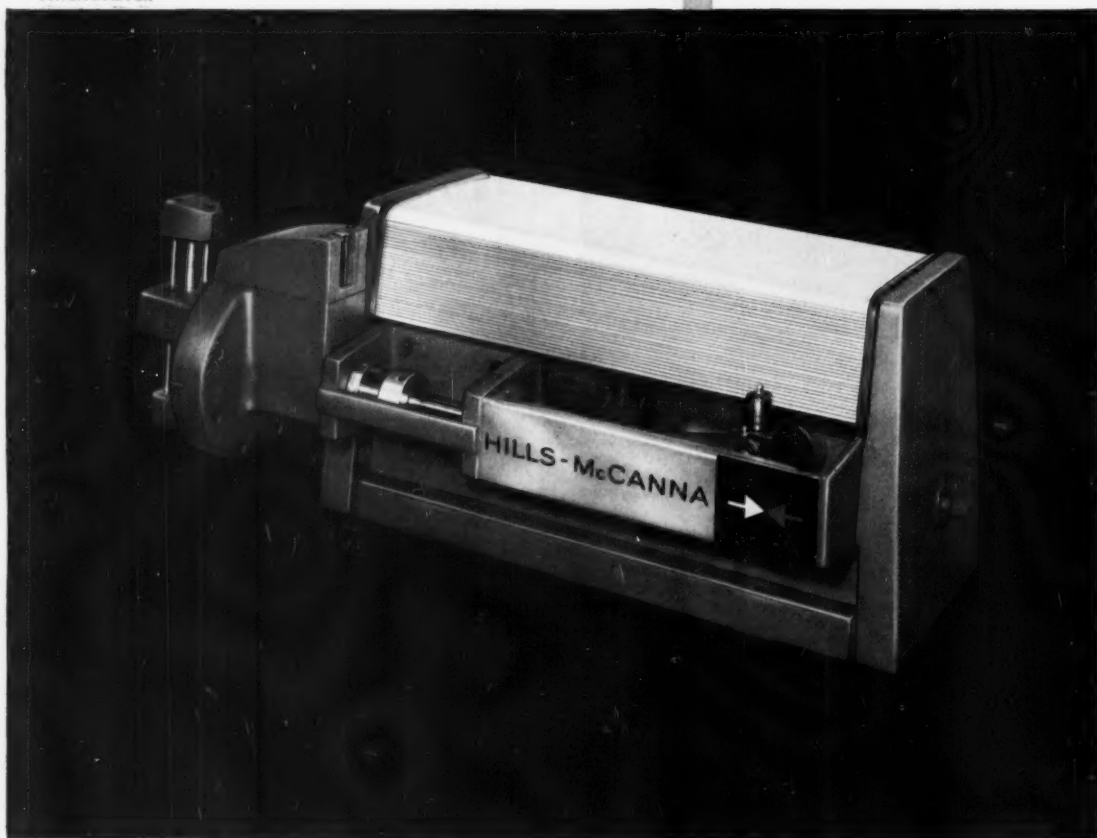


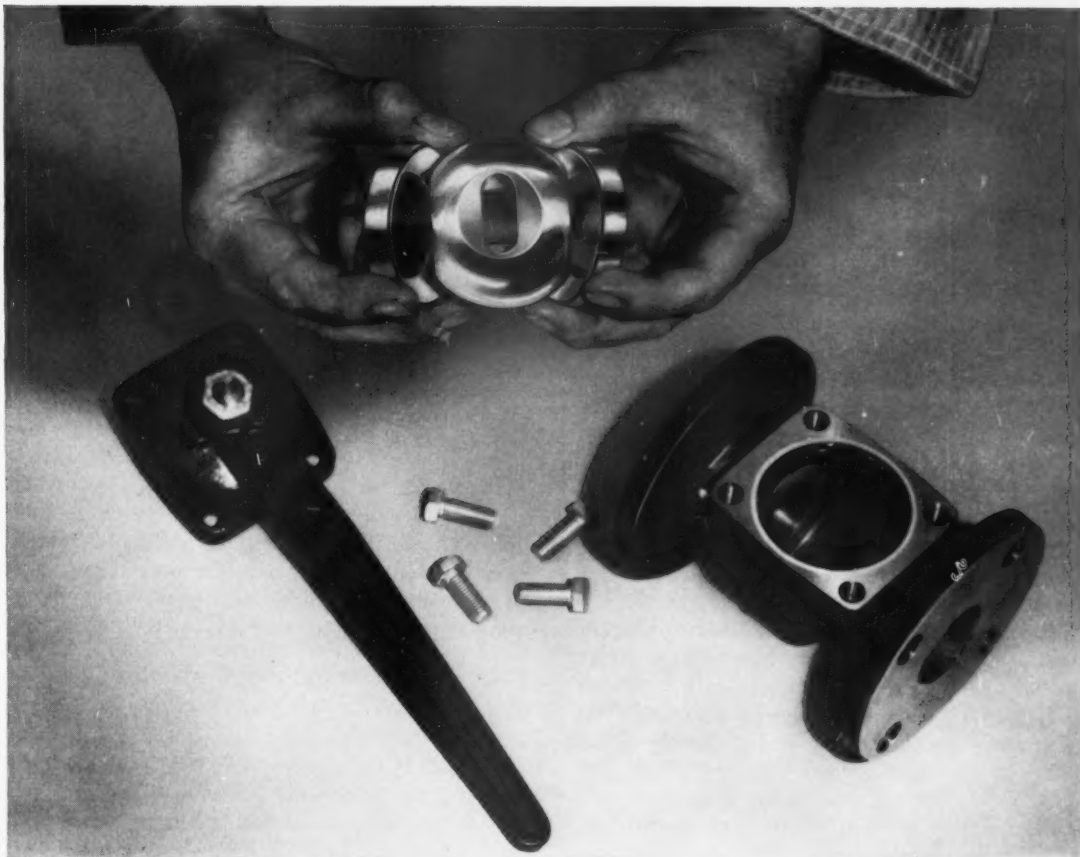
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News for the Consultant

Standard Coding For Computers

R. E. Kingery of the New York Public library was recently appointed chairman of a new committee being set up under the procedures of the American Standards Association to study the possibility of establishing a standard coding and indexing system that could be used interchangeably by electronic computers for machine searching of technical and scientific information.

"For many years the procedures of the American Standards Association have proved successful in providing the necessary consensus for establishing standards for all who will use them," Kingery stated. He was addressing delegates to the International Conference for Standards on a Common Language for Machine Searching and Translation, a week-long meeting being held under the sponsorship of Western Reserve University and the Rand Development Corporation. The conference has as its purpose the exchange of information and experience on the possibility of establishing a standard or compatible "machine language" so



that information compiled by one machine could be processed or used interchangeably on another.

William H. Offenhauser, Jr., a consulting engineer, presented a paper on the normal operation of national and international projects on standardization, specifically those of ASA and ISO.

Kariba Dam Nearing Completion

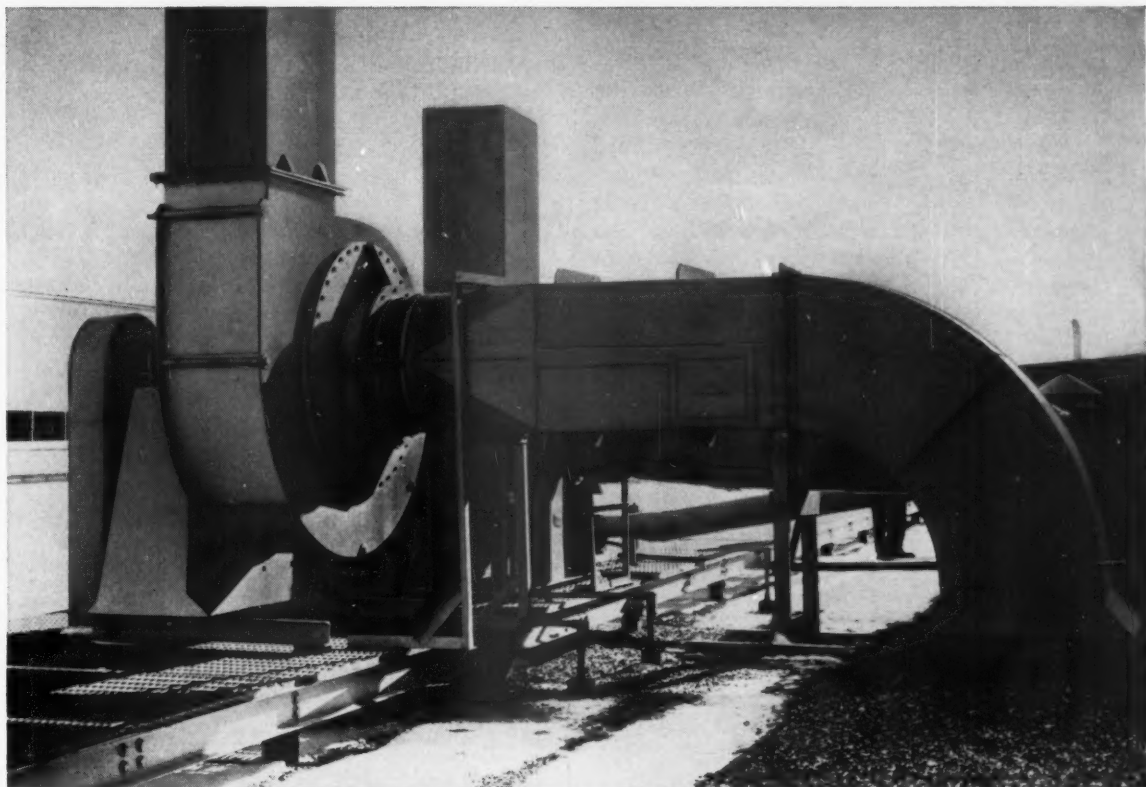
Pouring of concrete for Africa's Kariba dam on the Zambesi River is nearing completion. The dam itself is 420 ft high with a crest of 1900 feet. It required 2.2 million yards of concrete and the 2000 square mile lake has already begun to form behind the dam. Begun in 1955, it is now estimated that the civil engineering aspects of the project will be



Nearly complete Kariba Dam is 420-ft. high with 1900-ft. crest and will require 2.2 million yards of concrete.

Another new development using

B.F. Goodrich Chemical *raw materials*



Blowers and fans, ductwork and fittings and bolts, nuts and washers are all manufactured of Geon by Industrial Plastic Fabricators, Inc., Norwood, Mass. B. F. Goodrich Chemical Company supplies the Geon polyvinyl material.

Blower and ductwork of Geon solve corrosive fume problems

The manufacturer of this air handling equipment can promise buyers efficiency as high after years of operation as right now. The equipment is made from sheet made of Geon rigid vinyl. Unlike conventional coated blowers and fans which usually handle just one type of chemical fume, this equipment withstands corrosion and residual build-up of nearly all chemicals. Installations are often lower in cost because of weight savings.

Sheet of Geon rigid vinyl is extremely versatile for fabrications

like this—it can be heat-formed to a variety of shapes, precision welded, machined and finished to close tolerance. The flexibility made possible with Geon makes possible new design features impractical with other materials because of prohibitive costs.

Geon rigid vinyl materials are providing new applications and new markets for a broad variety of manufacturing companies. For information about the many forms in which Geon can be obtained, write Dept. FC-4, B. F. Goodrich Chemical

Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.



B. F. Goodrich Chemical Company
a division of The B. F. Goodrich Company



GEON polyvinyl materials • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

completed by November of this year. In January 1960, the first turbo-generator is scheduled to go on the line. Consulting engineers on the joint venture project are Sir Alexander Gibbs & Partners, Coyne & Bellier, and Sogei, all European firms.

Radiant Heating For Filtration Plant

An unusual method of maintaining operable temperatures in a filter area during winter operations at Oradell, N. J. has proved both economical and efficient for the Hackensack Water Company during more than four years of operation. Charles F. Jost of the consulting engineering firm, Buck, Seifort and Jost, New York City, who designed the system says, "the radiant heating system has performed in accordance with our design specifications and the client is satisfied."

The installation consists of two heat zones, a hidden ceiling and floor panel fabrication of wrought iron pipes embedded in concrete, radiating their heat loads to the centrally located 2330 sq ft operating gallery. Capacity of this new addition is 18 million gallons per day. The entire plant processes 60 million gallons per day.

The design problem as explained by Jost was to handle a 600,000 Btu heat loss with a minimum of radiating area. Neither the ceiling nor the floor alone had enough area to handle the job. In addition,

it was considered desirable to minimize convection currents between the heated operating gallery and the unheated filter area, suppressing wall and window condensation problems which are normally existent with other types of heating.

E. J. Wohrle Company, Fairview, N. J., installed the Byers corrosion resistant pipe utilized for both ceiling and floor zones.

New Rapid Transit Plan Proposal

The consulting engineering firm of W. C. Gilman & Co. of New York City has just completed a survey for the city of St. Louis and environs that took nearly three years. It is being termed the most comprehensive study on transit and traffic ever accomplished for a metropolitan area. As a result, a long range program has been drafted covering 20 years and costing \$340 million. The main feature is a rapid transit system using buses which would travel, in some sections, over specially designed elevated roadways.

The network would consist of 106.5 miles of rapid transit service including an elevated loop in the downtown business district and seven radial routes connecting with outlying sections. The routes would be laid out and constructed in conjunction with present area facilities. Although fares will remain the same, the engineers say passengers will move twice as fast as on the present bus system. A \$20 annual use tax on passenger cars registered in the city and St. Louis county would partially finance the project.

In addition to the elevated roadways for buses only, buses will share expressways and other roads with general traffic in noncongested areas. Proponents of the system declare that it would attract enough customers to reverse the present downward trend in the use of mass transit in the city. Special monthly rates and park-ride lots where customers might park their cars and board a bus will be offered. The survey predicted that the situation could only worsen, the streets reaching saturation at peak hours and congesting traffic long after it should subside. Subways were discarded as too expensive and the logical solution was the space over the streets.

Other pertinent features for the plan include:
 ¶ Downtown parking garages at points where existing or projected expressways reach the area
 ¶ Development of a short-time parking garage, possibly a downtown postoffice site
 ¶ Program of street and highway improvements
 ¶ Establishment of an area-wide authority to carry out the plan
 ¶ New and revised traffic controls

Pointing out that the system could not hope to operate without subsidy, the engineers suggested

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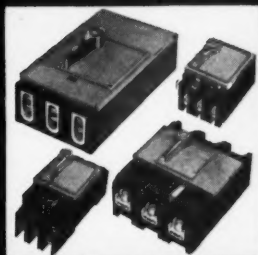
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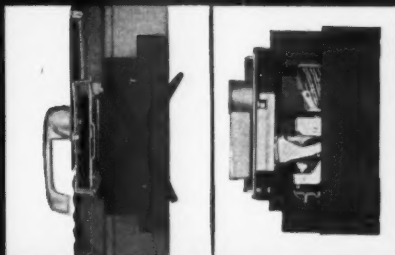
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The Best in Electrical Distribution and Control Equipment.

NOVEMBER 1959

additional financing could be secured by issuance of \$175 million in 40 year revenue bonds at 5 percent interest.

James E. Crowe, chairman of the Citizens Metropolitan Transit Committee, expressed hope that "community leadership will take a definite stand and not allow this plan to gather dust on the shelf."

Computers Aid Bridge Design

The Bureau of Public Roads has found the use of electronic computers well suited for the design of bridges and as a result has about 70 electronic programs for high speed computation in bridge superstructures and substructures. These BPR programs are available to the various state highway departments as another step in the government's program to furnish scientific aids to local agencies. The savings in time and the obvious advantages of uniform design and standard parts are readily apparent although some difficulty has been encountered in preliminary studies of skewed structures. In addition, the computer program provides dimensions and elevations for fabrication and construction.

Technical Center for Libby-Owens-Ford

The use of glass in modern curtain wall construction was demonstrated ably in the current expansion project at the Technical Center of Libby-

Owens-Ford Glass Company, Toledo, Ohio. Two buildings were involved, a new engineering building and an entrance rotunda with a connecting concourse. All exterior walls are made of glass. To control light, fixed windows have vertical louvered



Glass curtain wall construction is demonstrated in this new engineering building and entrance rotunda at Libby-Owens-Ford Glass Company, Toledo, Ohio.



traveling blinds, matching the color of the walls. The windows reduce glare and absorb much of the radiated solar heat. In daylight they minimize outward visibility for those inside. With the exception of the concourse, all of the new structures have concrete slab roofs and partitions of metal with clear plate glass above the wainscoting.

Giffels & Rossetti, Detroit engineers and architects, prepared the original design. General contractor was George Lathrop & Sons, of Toledo.

BRI Conference

The Building Research Institute will hold what it anticipates will be its largest conference to date

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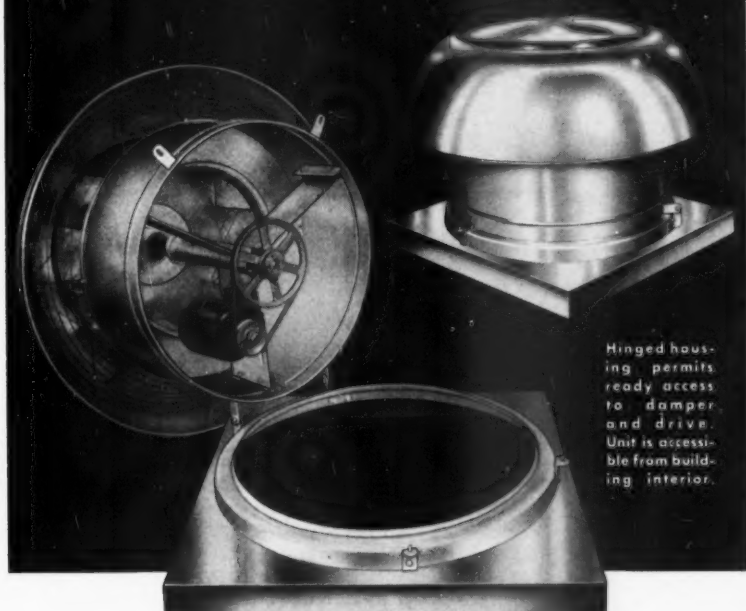
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- Exclusive guide vane construction improves air moving efficiency while minimizing turbulence and noise.

- Adjustable motor pulley permits speed variation.

- Totally enclosed motor and tubular drive assembly feature permanently sealed, pre-lubricated ball bearings. Motor is effectively cooled by air stream.

- Bird guard of heavy gauge stainless steel is an integral part of every unit.

- Maintenance-free aluminum housing provides strength without weight.

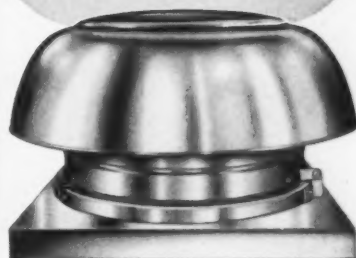
The HAB Series of "HI-D" Exhausters (axial blade) gives highest air-per-dollar value in short duct runs where static pressures are negligible. The HCB Series (centrifugal wheel) effectively overcomes static pressures and is usually preferred for long duct runs. Its smaller diameter permits a corresponding reduction in duct size.

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at the Shoreham Hotel, Washington, D. C., on November 17-19. "Many firms are planning to send five to ten men," commented Conference Chairman Thomas E. Werkema, research analyst for Dow Chemical. He continued, "In making this conference open to the interested public, as well as to BRI members and guests, we hope to draw together a broad cross section of architects, engineers, and building scientists from all fields who are interested in planning tomorrow's buildings today. Before we can start building laboratories and dwellings for outer space, there are a few problems we must still lick in our construction of buildings resting on terra firma."

One of the more interesting topics to be discussed will be "New Heating Techniques for Buildings," under the chairmanship of John Everetts, Jr., consulting engineer, of Charles S. Leopold, Engineers. Among the other subjects will be: sandwich panel design, metal curtain walls, modular building standards, troublesome aspects of building research, and a comprehensive examination of the distribution, cataloging, and indexing of the vast amount of new building science literature.

New Stamp Features Engineering Project

A new stamp, recently issued by the Island Territory of Aruba, Netherlands West Indies, is un-

doubtedly the first to honor a newly constructed water distillation plant. A line of huge cast iron evaporators is shown in the photograph which ap-



Unusual postage stamp commemorates a newly constructed water distillation plant in the West Indies, designed and built by Singmaster & Breyer, Inc.

appears on the stamp. It is a portion of the government-owned sea water distillation plant recently designed and built by Singmaster & Breyer, Inc., consulting engineers of New York.

Industrial Building Exposition

Plans are being made for the first Industrial Building Exposition and Congress ever held. It will be convened at the New York Coliseum, Dec. 12-15, 1960. Clapp & Poliak, Inc., the New York exposition management firm, will handle both events. The board of sponsors consists of 28 of the nation's most prominent engineers, architects and industrial executives.

Some of the subjects to be considered at the congress are:

- ¶ Planning new construction
- ¶ Financing
- ¶ Modernization of old buildings
- ¶ New techniques of construction
- ¶ Plant layout
- ¶ Construction materials
- ¶ How to choose a site
- ¶ Maintenance problems

Three co-chairmen head the board of sponsors. They are Albert C. Martin, Jr., Albert C. Martin & Associates, Los Angeles; N. M. Martin, director, facilities planning and construction, International Business Machines Corp., New York; and Clifford S. Strike, president, F. H. McGraw & Co., Inc., New York.

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cold damp Arctic, Kerite, wherever it is used, can be relied on for outstanding performance. That's why there is little cause for surprise when Kerite Cable laid in unusually difficult installations 40 or more years ago is found still to be in perfect operating condition today. Kerite's acceptance is greatest with those who have used it longest. Endurance, over the years, breeds confidence.

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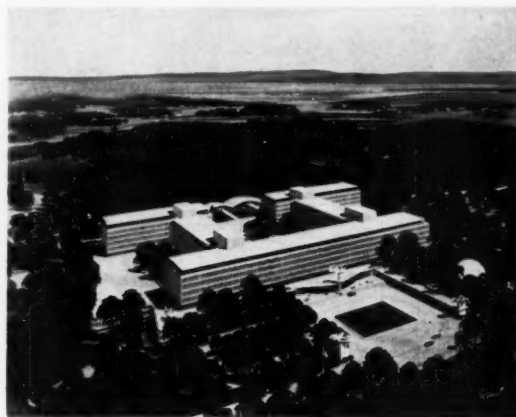
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Central Intelligence Agency Building

Scheduled to be completed in 1961, the CIA's new multi-million dollar headquarters in Langley, Virginia will furnish over a million square feet of air conditioned office space for the agency's far-flung



New multimillion dollar Central Intelligence Agency under construction at Langley, Virginia location.

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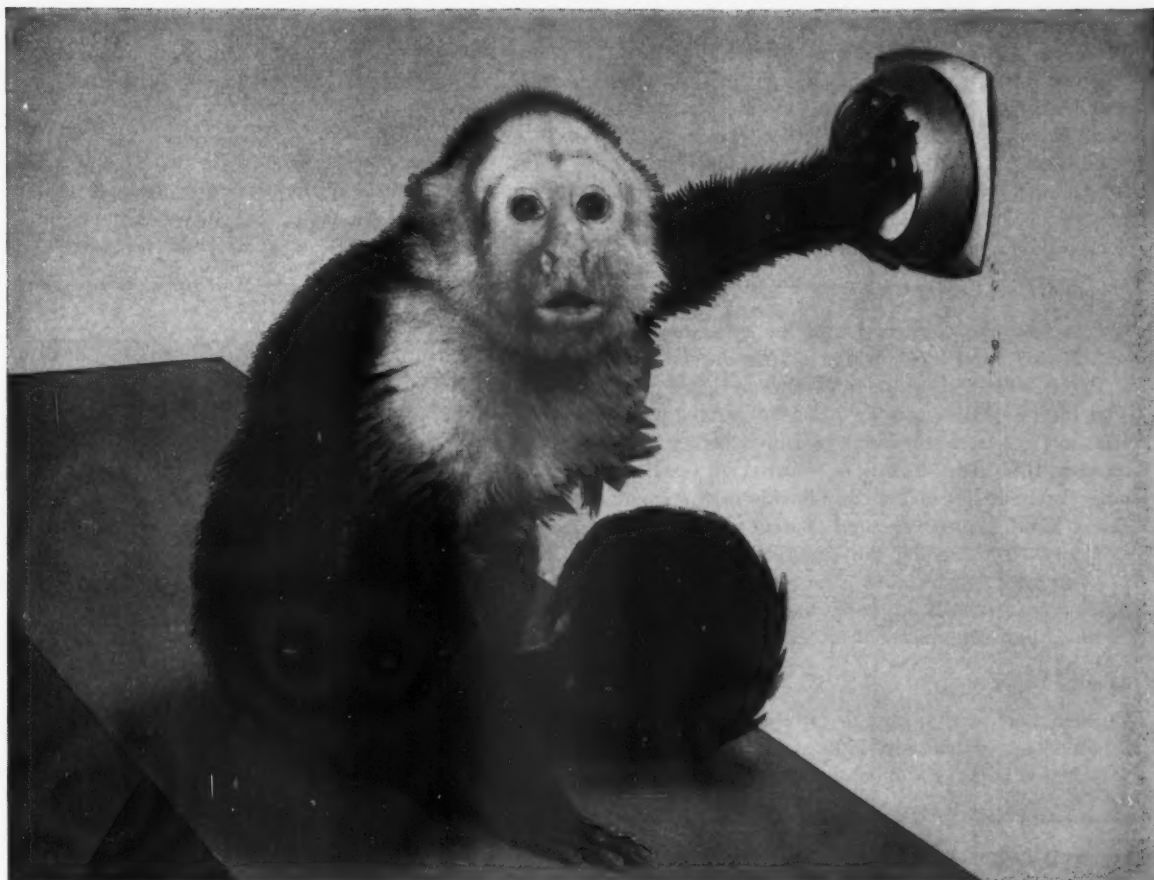
activities. Facilities in the 8-story structure will include a large cafeteria capable of handling the feeding of 1400 people.

Consulting mechanical engineers for the building are Syska and Hennessy, New York; architects are Harrison and Abramovitz, New York; and general contractor is Charles H. Tompkins Company, of Washington, D. C.

Private Atomic Power Plant In Sweden

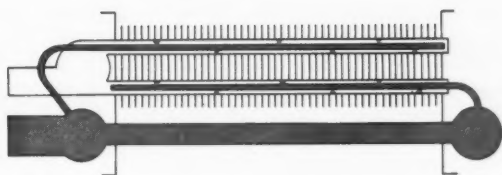
A minimum of \$20 million has been estimated as the entire cost for an atomic power plant to be built by a combine of eight large Swedish private and municipal power producers called the Atomkraftkonsortiet (AKK, Atomic Power Consortium). It will be located at Simsvarp on the Baltic coast and will probably be of foreign design as tentative offers have been invited from the United States and Great Britain. No final decision as to the type of reactor has been made.

Work is scheduled to start in 1960 with the first stage reactor having a capacity of 50-60 mw. It is estimated that the plant will be operative by 1965.



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The reactor will be built under license in Sweden while the fuel will be supplied by the foreign firm.

The Simpvap reactor probably will be Sweden's first industrial power-producing atomic plant. The State Power Board's R4/Eva Project has been delayed and the R3/Adam plant which will become operative in 1963 is primarily intended for district heating of the Stockholm suburb of Farsta and will only supply a minor amount of electric energy.

Panama Canal Gets Bridge

Contract for the construction of the superstructure of the first high level bridge across the Panama Canal is expected to be awarded in December. The bridge is designed to clear the canal by 201 feet and has a cantilevered, tied-arch center span of over 1000 feet. It will be located at La Boca near Panama City on the Pacific side of the canal. Brice Smith, Sverdrup and Parcel Engineering Company, is designing the structure and also supervising its construction. The substructure contract was awarded in June to a joint venture, Fruin-Colnon International of St. Louis.

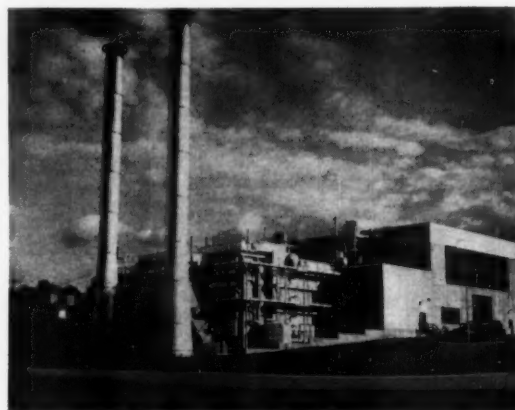
Missile Bases

Construction of new missile projects with an estimated cost of between \$100 and \$150 million is anticipated in Kansas and Missouri in the next few

years. So stated Colonel L. E. Laurior, District Army Engineers, speaking to the Eastern Chapter of KES. Kansas also may get a new Atlas base.

Managua Power Plant

The Managua power plant, with two 16,000 kw turbine generator units now in operation, is supplying power to Managua and 14 other towns in Nicaragua. The boilers are designed for 160,000



Managua, Nicaragua power plant has two 16,000 kw turbine generators supplying power to the region.

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lbs per hr each and are of semi-outdoor design. Working pressure is 900 psig with a total temperature of 910 F at the superheater outlet. The fuel for the boiler is Bunker 'C' oil.

The Kuljian Corporation, of Philadelphia, handled design, engineering, procurement, supervision of construction, and initial operation. Equipment specifications were based on American practice and standards although all electrical equipment was supplied by Siemens-Schuckertwerks, of Germany, and boiler room equipment was supplied by Babcock & Wilcox's German subsidiary.

High Altitude Sunlight Filtered

Glass blocks are used to filter the bright, high altitude sunlight of Mexico City (altitude — 7345 feet) in a new office building constructed there for the Industria Nacional Quimico Farmaceutica. Three sides of the seven-story building are entirely of glass with the blocks being used both above and below the unusual windows, which are made of a glare-reducing glass.

Because the building was intended for use as engineering and drafting rooms in addition to office space, INQF officials required a diffused, shadow-free light of moderately high intensity. "Suntrol"

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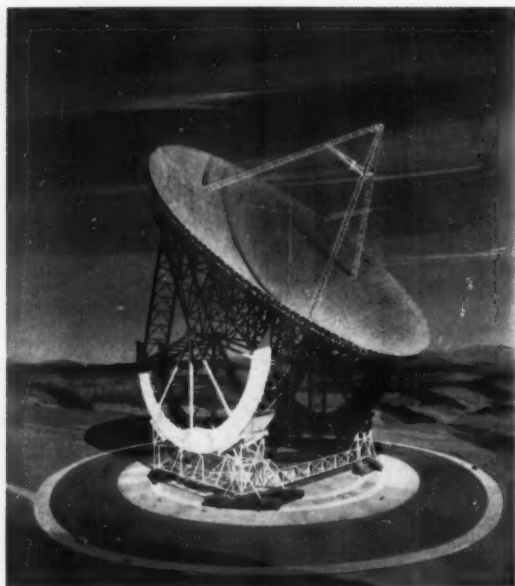
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blocks were chosen. A product of the Pittsburgh Corning Corporation, these blocks have an internal blue-green fibrous screen to cut glare and instantaneous heat gain.

Consulting engineer for the building design was Armando Hoyos Macedo and the architect was Enrique Del Moral, both of Mexico City.

Largest Radio Telescope

The world's largest radio telescope is being erected by the Navy on a 1500-acre site in Sugar Grove, West Virginia. It is termed by one of the contracting officials "an engineering feat as unusual as was the building of the Brooklyn Bridge a century ago." Completion of the 20,000-ton facility is sched-



The world's largest radio telescope is being erected by the Navy on a site in Sugar Grove, West Virginia.

uled in 1962 and will give the U. S. the world's most powerful "ear to the universe." Called the Naval Radio Research Station, it will enable Naval Research Laboratory scientists to tune in on radio signals emitted by astral bodies as far out in space as 38 billion light years, 19 times the distance probed by the 200-in. optical telescope at Mount Palomar, California. The diameter of the aluminum mesh reflector dish will be 600 feet, equal to the length of two football fields. Its area will exceed seven acres.

The contracting agency was the Navy's Bureau of Yards & Docks, acting for the Naval Research

Laboratory whose scientists formulated the basic specifications. The \$79-million project is being designed by Grad, Urbahn & Seelye, New York engineers and architects.

New Medical Research Institute

Chicago Medical School recently held groundbreaking ceremonies for a new \$14-million Medical Research institute to be erected on the school's 10-acre campus in the West Side Medical Center, Chicago. A 10-story, block long building of modern design it will incorporate the latest air conditioning, fluorescent lighting, and intercommunication developments to provide optimum working conditions. Pneumatic tube systems, closed circuit TV, high speed elevators, ceramic wall tile, acoustic ceilings, and stainless steel laboratory equipment also are included in the plans. Engineering and design consultants on the project are A. Epstein & Sons, Inc., of Chicago.

New Map Plotting Device

A new polar coordinatograph developed by Svenska AB Gasaccumulator, AGA, in cooperation with the Swedish Land Survey Office is proving to be an efficient aid to draftsmen who are required to do a great deal of map plotting. It is a high precision optical instrument with a variable eyepiece which allows the user to alter the field of vision.

New Hydroelectric Plant Built Underground

Sweden's largest and newest hydroelectric station was opened recently at Stornorrforss on the Ume River. While the Ume ranks only fifth in size among Sweden's rivers, its head of 246 feet with a mean waterflow of 16,000 cubic feet per second offers a power potential not matched by the others.

The 375-mw station is built underground off the river bed and the water is conducted through a 1½-mile canal to the three turbines and then back through a 2½-mile tailrace canal to the original channel. The catchment area totals 4.4 square miles and has a length of 13 2/3 miles.

A total of nearly 105,930,000 cubic feet of earth was removed in the course of construction and an almost equal amount was handled in driving tunnels and other underground excavation. A Swedish technique, based on the use of Atlas Copco equipment, was used to great advantage in the tunnel driving jobs. Both drilling from truck-mounted multifloor platforms and bench driving by means of jigs with chain-fed drills were used. The State Power Board, which was responsible for the overall planning and present operation, states that the final cost of \$43 million corresponds to \$110 per kw, a figure which certainly justifies the unusual engineering approach. ▲▲

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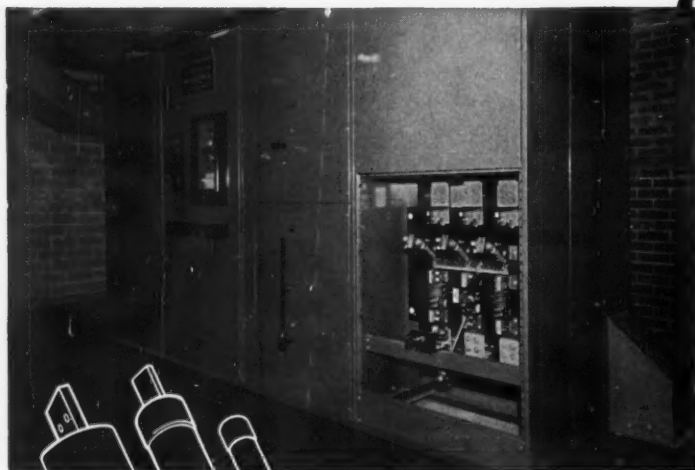
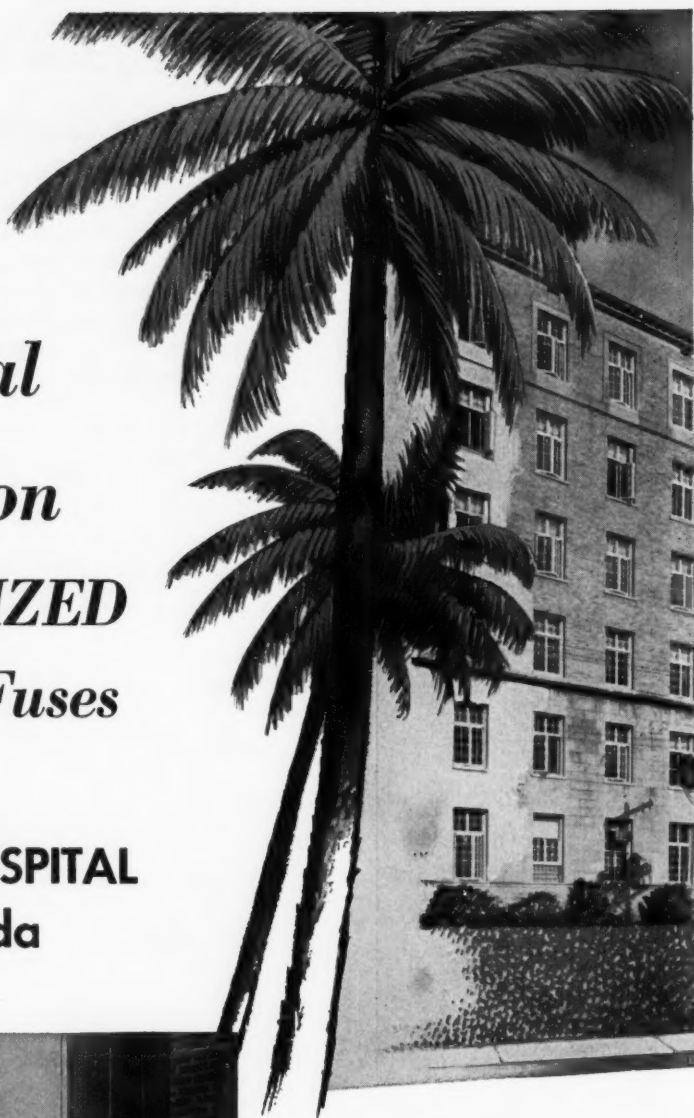
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WHY DEPENDABILITY IS NEEDED

With higher fault currents available, the dependability of the protective device becomes of increasing importance.

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A fuse is the only type of protective device to offer this advantage. A fuse must remain safe and accurate, as its operation depends on a simple thermal law. A fuse has no triggers, latches, pivots or contacts to stick or get out of order. Dust, fumes, corrosion or age cannot increase a fuse's capacity or lengthen its blowing time.

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On BUSS Hi-Cap fuses - (loads above 600 amps.) - write for Bulletin HCS

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Mahon M-FLOOR Construction



New City-County Building, Indianapolis, Ind.

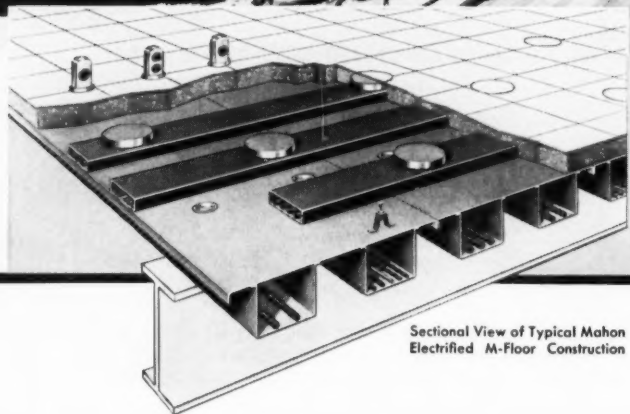
Mahon M-Floor Construction throughout this modern building assures adequate in-the-floor raceways to meet any future requirements in electrical distribution or intercom wiring.

Architects and Engineers:

Allied Architects & Engineers of Indianapolis, Inc.

Associate Architects: Harley, Ellington & Day.

General Contractor: Huber, Hunt & Nichols, Inc.

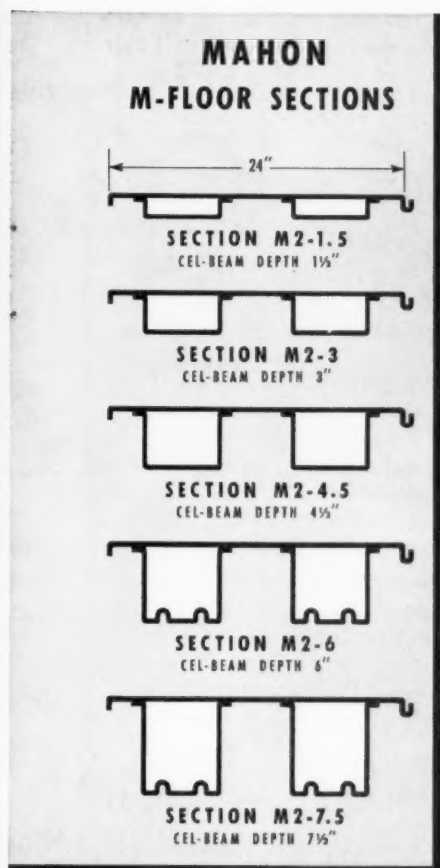


Sectional View of Typical Mahon Electrified M-Floor Construction

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- Acoustical and Troffer Forms
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- Structural Steel—Fabrication and Erection
- Steel Plate Components—Riveted or Welded

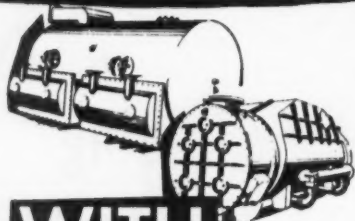
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Men in Engineering

Three executive appointments at Abbott, Merkt & Co., New York engineers and designers, have been announced. Richard O. Walker, Jr. has been appointed vice president; Richard J. Bush has been elected to the board of directors; and J. Stanley Nants, Jr. has been appointed director of the firm's architectural division.

Milton P. Barschdorf, Colonel, USED (ret.), recently joined Frederic R. Harris, Inc., Consulting Engineers, as its Lower Mississippi Valley area representative. He will make his headquarters at the 1915 Tulane Avenue, New Orleans, Louisiana office of Frederic R. Harris, Inc. Colonel Barschdorf recently retired from 21 years of duty with the Corps of Engineers, his last assignment being District Engineer of the Vicksburg, Miss. District.

Marshal McCord, chief engineer, and Ernest F. Siegel, chief mechanical-electrical engineer, have been named associates of Green Associates, Inc., consulting engineers, Baltimore, Maryland.

Harry A. Kuljian, president of The Kuljian Corporation, engineers and constructors, Philadelphia and Harvey F. McPhail, hydroelectric division manager of the international engineering firm, were members of the nine-man team from the Senate Committee on Interior and Insular Affairs that recently visited Russia to view Soviet hydroelectric dams and other power facilities.

David M. Fleming and Hugh E. Mulholland have joined the staff of Daniel, Mann, Johnson & Mendenhall, architects and engineers, of Los Angeles, Fleming as associate director, industrial and mili-



FLEMING

MULHOLLAND

tary projects, and Mulholland as special consultant to the firm's civil engineering and public works clients. Prior to joining DMJM, Fleming was contracts manager for corporate joint ventures at Lockheed's Missile and Space Division, with responsibility for sales planning, market analysis, contract negotiation, and intra-corporate liaison. Mulholland has had experience in the consulting field with both Integrated-Constructors & Engineers, Inc. and S. B. Barnes & Associates.

In addition, Oscar Benjamin Beasley, Col., USA (ret), has been assigned to represent DMJM in the operation of the firm's (nonmilitary) current and future projects within the 15-nation European NATO area and NATO family of nations, as well as in the more limited European Common Market area. Colonel Beasley will head the



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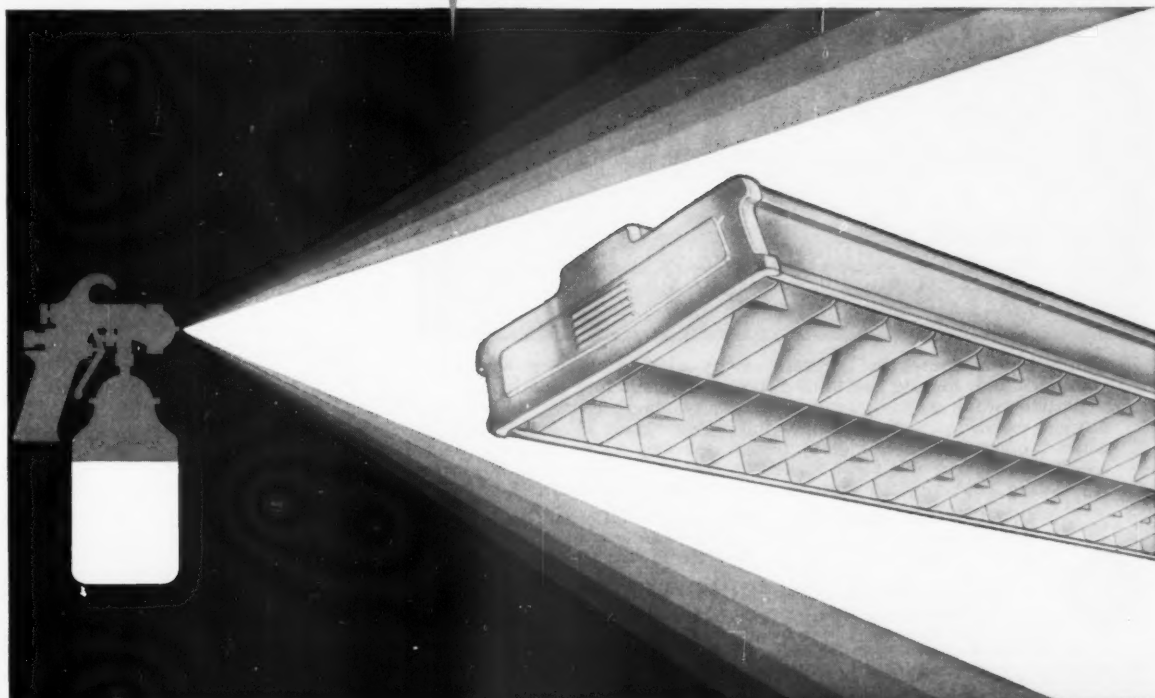
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				Grease	Tobacco Smoke								
GOOD QUALITY FINISHES	8.0	8.5	8.5	7.5	6.5	5.0	7.0	8.0	8.5	8.5	7.5	8.0	6.0
NEW GUTH LUCITE* FINISH	9.5	10.0	9.5	8.5	9.0	9.0	10.0	22.0	9.5	10.0	8.5	9.0	9.0
PERCENT BETTER	18.75%	17.65%	11.76%	13.33%	38.46%	80.00%	42.86%	175.00%	11.76%	17.65%	13.33%	80.00%	50.00%

(1) 30 min. at 400° F. * © DuPont

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Conco CRB Electric Crane used for indoor-outdoor service at Underwriters' Laboratories, Chicago, Ill.



firm's Paris office with responsibilities for operations management, new business representation, representative liaison with current and future projects, and act as advisor for the firm's European services and methods.

Sylvan L. Hanauer announces his resignation as Deputy Commissioner of the Department of Air Pollution of the City of New York. He will devote full attention to his engineering and real estate consulting practice, with offices at 501 Madison Avenue, New York City.

Alfred K. Allen has been named executive vice president of Folmar & Flinn Industries, Inc., construction and engineering firm of Montgomery, Alabama.

Dale D. Jacobson has assumed the ownership and management of the Ericson Engineering Company, telephone engineers, of Hector, Minnesota. Harold L. Ericson will be associated with the company only in an advisory capacity.

Announcement has been made of the appointment of Hugh E. Keeler, P.E., Professor Emeritus, Mechanical Engineering, University of Michigan, as a director of The Hinchman Corporation, engineers, of Detroit, Michigan.

A. W. Peabody has been appointed supervising engineer of the corrosion engineering group of Ebasco Services Incorporated. Peabody has been with Ebasco for 22 years, and since 1939 he has concentrated on a wide variety of corrosion engineering projects for many utility and industrial companies.

The Oklahoma City Chamber of Commerce board of directors presented the Benham Engineering Company, Oklahoma City consulting engineering firm, with a Certificate of Achievement in recognition of the company's 50th anniversary. The certificate read, in



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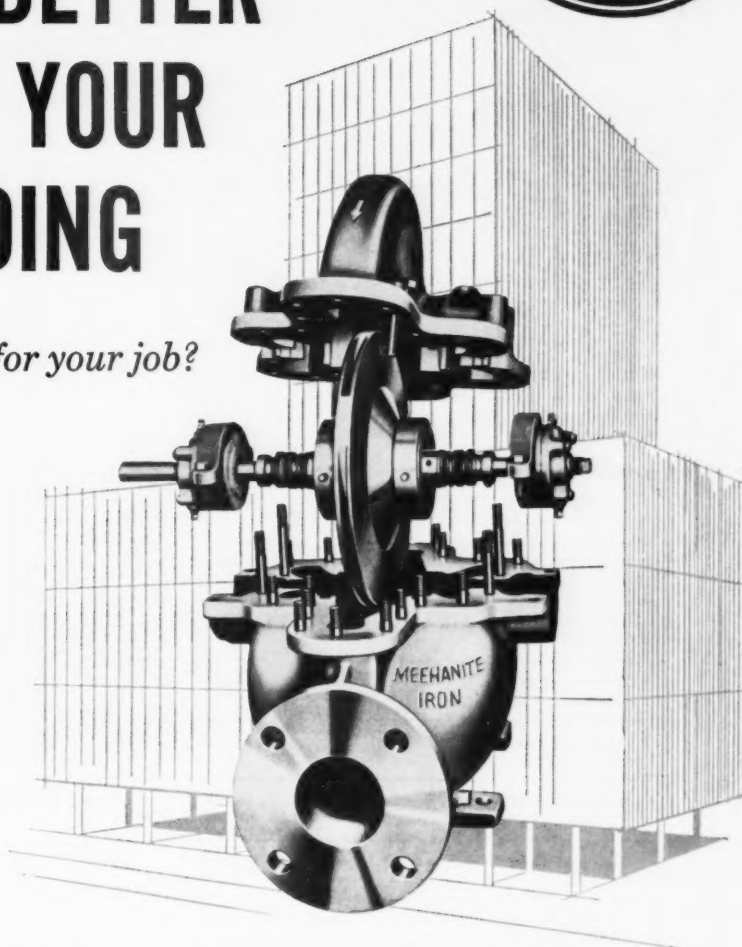
Fast, Easy Installation—Peerless AquaLine pumps install quickly in new or existing systems. No special tools are required. Take it out of the package and put it to work.

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AquaLine Characteristics:

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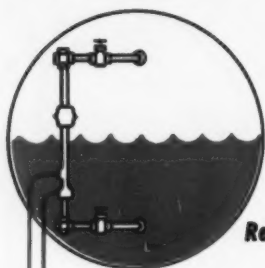
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Remote indication saves time—increases safety



Any water-containing vessel is a potential hazard, whether it's fired or unfired. For most efficient control, gages for all vessels should be out in the open, or at control stations.

Where remote reading gages should be used:

Stationary power boilers	Water treatment systems
Feed water heater tanks	Heating boilers
Waste heat boilers	Storage tanks
Surge tanks	Marine power boilers

What you should expect in a remote reading water level indicator	Reliance EYE-HYE
Flexibility of placement. Gage reading precisely where most convenient to use — even above the boiler.	✓
Sharp visibility. Easy to read green indicating fluid, illuminated.	✓
Scientific accuracy. U tube manometer principle for laboratory exactness.	✓
Simplicity. Smooth hydrostatic action — no mechanical working parts.	✓
Safety. Invites frequent reading — an aid to preventing water level accidents.	✓
Easy installation. Flexible tubes from boiler to gage window.	✓
Low maintenance. Scheduled cleaning only at infrequent intervals. Easy to blow down.	✓

Write for Bulletin CO and learn how EYE-HYE can increase the reading efficiency of all your liquid levels.

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part, "for the outstanding achievement that has been made during the history of the company extending back a half-century to its founding in 1909 by the late Webster Lance Benham."

Colonel Mathew V. Pothier, USA (ret.) has joined the staff of Finkbeiner, Pettis & Strout, consulting engineers, of Toledo, Ohio. Colonel Pothier formerly was associate professor of civil engineering at Ohio Northern University.

Morris Backer, group leader of the mechanical engineering section of H. E. Bovay, Jr., consulting engineers, Houston, has been named an associate of the firm.



BACKER

CASSELMAN

Theodore E. Casselman, Jr., assistant engineering manager in the Boston office of Stone & Webster Engineering Corp., has been named manager of the New York office.

L. L. Denson has opened an office, at 211 Delta Building, 348 Browne Street, New Orleans, Louisiana, for the practice of mechanical engineering. Denson formerly was senior mechanical engineer with B. M. Dornblatt and Associates, Inc., New Orleans.

Henry Wilkens, Jr., municipal utility specialist with the Houston firm of Turner and Collie, Consulting Engineers, Inc., has been appointed a member of the National Defense Executive Reserve, the U.S. Department of Commerce announced. Wilkens is a member of the water, sewage, industry, and utilities di-



New Bulletin
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PENN VENTILATOR...

GIVES ALL THE FACTS ON THE MODERN WAY TO CURB

Bulletin SCE-89 contains all the information you'll need for quicker, less costly curbing operations. You'll learn why Penn Ventilator's new self-flashing extruded aluminum Sonotrol Curb eliminates field errors, cuts out tiresome coordinating, flashing and waiting... how it can be installed in just a half dozen uncomplicated steps.

Further, you'll learn how the acoustically insulated Sonotrol Curb helps to blanket and absorb sound waves. Complete construction details are graphically illustrated. And engineering data and suggested specifications are spelled out.

Why not send for your copy of this new extruded aluminum Sonotrol Curb Bulletin. Of course, there's no obligation. Write today to Penn Ventilator Co., Inc., Philadelphia 40, Pa.

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Please send me Bulletin SCE-89—"Self-Flashing Extruded Aluminum Sonotrol Curb."	
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The Kohler Memorial—a new school and community building.

provide planned protection against power-failure emergencies

Two 35 KW Kohler electric plants provide automatic, flexible stand-by power to meet specific needs in the Kohler Memorial, Kohler, Wis., when normal electricity is cut off.

The No. 1 plant provides power for heating and ventilating, stage switchboard, swimming pool lighting. Special switch gear enables an

operator to concentrate full lighting in specific areas, such as theatre or gymnasium during performances. The No. 2 plant provides emergency lighting throughout the building at 5 to 10 percent of capacity. Sizes to 100 KW, gas or gasoline, and diesel. Complete manual with suggested specifications sent on request. Write Dept. D-70.

SAFEGUARD

classrooms, swimming pools
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Models 35R88,
35 KW, 120/
208 volt AC.
Gas operated,
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Enameled Iron and Vitreous China Plumbing Fixtures • Brass Fittings
Electric Plants • Air-cooled Engines • Precision Controls

vision of the reserve pool of executives established by the Business and Defense Services Administration for production agency duty in a national emergency.

Richard W. Black, formerly manager of the Baltimore Division of Burns and Roe, Inc., consulting engineers, has been named government projects engineer at Vitro Engineering Company, New York.

Norman F. Garton, Rear Admiral, USN (ret.) has been appointed vice president for project development at the Conley Engineering Co. of Los Angeles. Prior to joining the Conley firm, Garton was head of facility engineering for Hughes Aircraft Co., handling major construction programs involving expansion and conversion.

James M. Bower, formerly assistant professor of civil engineering at Virginia Military Institute, has accepted the position of head sanitary engineer at Patchen, Mingle-dorff and Williams, consulting engineers, of Augusta and Atlanta, Georgia.

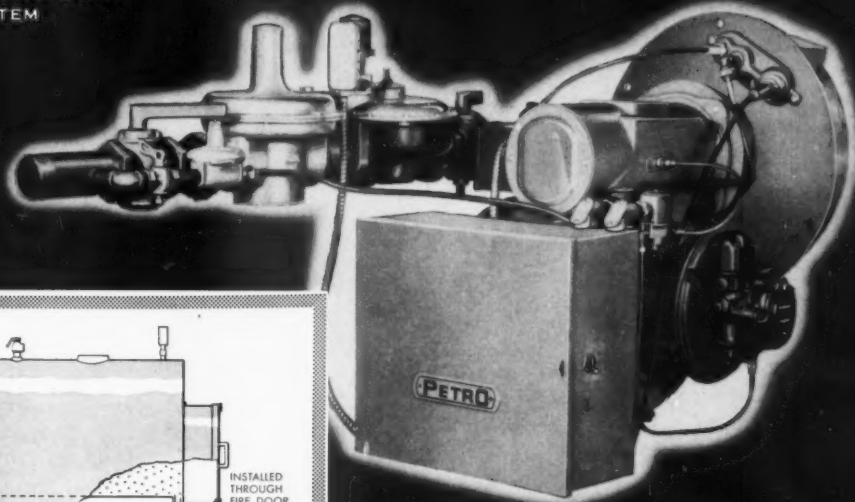
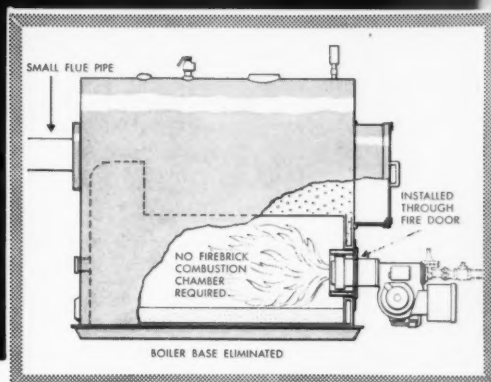
A new firm, L. H. Doane Associates, Inc., consulting engineers, with offices at 100 S. French Street, Wilmington, Delaware, has been formed. Members of the firm are: Louis H. Doane, Vincent M. Boyce, William C. Burkett, Joseph E. Plotts, Jr., and Willard J. Orr.

Paul Ehrenfest has been named an associate of Willard F. Schade and Associates, consulting sanitary engineers, of Cleveland, Ohio.

A new firm, Jacoby & Associates, Inc., offering engineering electronic computation and aerial photogrammetry services, has been formed, with offices at 27 West John Street, Hicksville, New York. The company was founded by Howard Jacoby, formerly chief computer services engineer of Photronix, Inc. The new firm offers the full range

New all-in-one burner *bolts to boiler front*

TWO FUELS
INTEGRAL CONTROL PANEL
FORCED OR NATURAL DRAFT
BUILT-IN AIR SYSTEM



Average installation saving in firebox boilers: \$250

Substantial savings in installation costs are made possible in a firebox boiler by the elimination of the boiler base and fire brick combustion chamber. Fits any boiler; bolts to the boiler front. Complete forced draft, fuel and control systems are built into the burner. No secondary air construction needed.

Also available as boiler-burner unit

Packaged boiler with integral burner can be delivered at site, ready for service connections. No brickwork, pit, or special setting required.

No high stack needed

In a sealed fire box no stack is required; merely a vent. Air is supplied under forced draft. In conventional boilers the stack can be shorter and smaller than required by the usual gas or oil burner.

Switches fuels instantly

Burns either fuel with high efficiency. Saves purchase of extra burner in areas where gas users must provide standby oil equipment. One-fuel models are also available for either gas or oil.

Cuts fuel costs

New type of burner head and improved fuel-air control develops exceptional combustion efficiency. Instant heat absorption. No wasteful refractories to heat up.

Costs less to operate

Requires no more supervision than a domestic burner. Maintenance problems are negligible, and can usually be handled by the janitor.

Capacities: oil, 4 to 30 gph; gas, 500,000 to 4,000,000 btu/h.

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**Makers of Quality
Heating and
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- PETRO, 3323 W. 106th Street, Cleveland 11, Ohio
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- Please send complete information on Petro P-240 dual-fuel burner and boiler-burner units.
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- Company
- Address
- City State

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"VITRIFIED CLAY PIPE THAT JOINTS LIKE MAGIC"

Meets Exacting Field Tests



It's not just idle boasting when we say that Presto-SEAL pipe by KAUL passes field test after field test with flying colors. As the accompanying photos show, Presto-SEAL installations are being made under rugged field conditions, yet contractors, engineers, and inspection authorities alike report faster on-the-job assembly; tighter, flexible and leak proof joints; permanent root proof and corrosive-resistant lines. Yes, Presto-SEAL, in sizes from 4" to 36", both standard and extra strength, is rapidly becoming the SPECIFIED choice for scores of sewage engineering and contracting firms. Why don't you specify Presto-SEAL pipe for your next job?

GENERAL INFORMATION

Job Location . . . Zanesville Interceptor Sewer
Zanesville, Ohio
Engineer Floyd G. Browne &
Associates, Marion, Ohio
Contractor Roger Au & Sons
Mansfield, Ohio
Materials 15,000 Ft. V.C. Pipe, A.S.T.M.
C-13 with Presto-SEAL joints,
6" to 24" diameter inclusive.

TEST DATA

Date of Test June 18, 1959
Size of Line 24" V.C. Pipe
Length of Line 250 Ft.
Type of Test Exfiltration
Allowable Loss 500 Gal./In./Mi./day

RESULTS

After line was filled only 90 min., loss was approx. 1/3 the allowable.

*T.M. Reg.

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of computer applications now generally in use, plus several developed by the founder. These include subdivision layout, traverse solution, water distribution system balancing, continuous building frame analysis, highway earthwork and geometrics, and bridge design.

Two engineers, instead of one as in the past, were honored with annual awards for distinguished services to their profession by the New York Chapter of the New York State Society of Professional Engineers at its annual dinner in New York City recently.

Awards were presented to Frederick C. Gardner, P.E., president since 1954 of Ebasco Services Incorporated, and to Max H. Foley, P.E., R.A., recently appointed as Chairman of the Board of Standards and Appeals of New York City by Mayor Wagner. Foley was a partner in the former firm of Voorhees, Walker, Foley & Smith.

Charles Wurmfeld, president of the chapter, said the double award was to provide recognition both for an engineer who had made a notable career in the business world and for an engineer who had given up the advantages of private practice for public service. The latter award is new.

Ralph Abramson, P.E., has been appointed chairman of the public relations committee of the Chicago Chapter of the Illinois Society of Professional Engineers.

R. C. Moulenbelt and V. W. Seifert, formerly executive engineers with A. M. Kinney, Inc., of Cincinnati, Ohio and New York, New York, have joined the firm of W. I. Barrows & Associates, consulting engineers, Dayton, Ohio.

Edward H. Sokolowski, P.E., formerly project engineer with Vogt, Ivers, Seaman & Associates, engineers and architects, Cincinnati, Ohio, has been appointed chief engineer of the firm's new branch office in San Antonio, Texas. ▲▲

Westinghouse electrical system
assures top efficiency for
Miami's modern new bank building



YOU CAN BE SURE...IF IT'S **Westinghouse**

Cover photo: Newest face on the downtown Miami skyline is the 18-story First National Bank Building — Florida's largest and Miami's oldest bank. The office tower, served by five Westinghouse high-rise elevators, offers more than 10,000 square feet of rentable area per floor.

Over-all view of the new bank lobby. Contrasts in lighting levels and in functional colors are used here to delineate areas. Traffic flow is well defined through use of a modern metal sculptured screen.

J-94122-2

Herbert H. Johnson, Weed-Johnson Assoc., Architects and Engineers, points out advantages of a bus duct vertical-rise electrical system, the electrical backbone of this new bank and office building, to Edward Clarke, Project Manager for Rooney-Turner, General Contractors; Charles W. Butsch, Westinghouse Construction Specialist, and Ralph W. Crum, President of The First National Bank of Miami.



Tenant comfort, efficiency and future expansion assured by preplanned electrical system

Downtown Miami's skyline has been impressively changed with the completion of the new First National Bank Building. Located on famous Biscayne Boulevard, the new building furnishes complete quarters for the bank's facilities, plus 13 floors of rental area. This is the third new building occupied by the bank in their 56 years of growth. It was needed to meet the latest demands for space and services.

Careful study of the bank's operations, its plans for growth and expansion, and needs of satisfied tenants established design criteria of the building. Complete and adequate electrical service now and for the future was carefully considered. The need for a coordinated, preplanned electrical distribution system was readily apparent.

The use of Westinghouse distribution equipment throughout the building was a result of unanimous

agreement between owner and architect-engineer. They both welcomed the opportunity to work with the Westinghouse construction specialist in careful preplanning of all phases of the electrical installation.

A Westinghouse distribution system was specified, with three parallel runs of Westinghouse bus duct distributing 277/480 volts in a vertical-rise design. On each floor, in electrical closets, Westinghouse quiet, dry-type transformers step down distribution voltage to utilization load of 120/208 volts. (contd.)

J-94122-3

S Over 250 Pages Westinghouse Data in Sweet's Construction File.

YOU CAN BE **SURE**...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV FRIDAYS

Charles Butsch and William Bausch, bank's Electrical Supervisor, in typical electrical closet found on each floor, showing three runs of Westinghouse 600-amp Life-Line® busway that distributes 277/480 volts throughout building. Here, Westinghouse quiet, space-saving, wall-mounted dry-type transformers step down voltage for distribution and utilization by Westinghouse NLAB and NH1B panelboards shown below.

Herbert Johnson (right) shows Charles C. Gaines, bank staff member, Westinghouse lighting panelboards completely concealed behind hinged wall in bank employees' beautiful new cafeteria. The employees' cafeteria, located on the second floor, includes complete meal service, as well as areas for relaxation, recreation and reading.





Electrical system preplanned for tenant comfort, efficiency and expansion (contd.)

This concept affords maximum efficiency in high-rise electrical distribution and utilization, readily adaptable for future expansion.

A Westinghouse construction specialist can be of service in your planning. Call the Westinghouse sales office near you, or write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania.

Owner: The First National Bank of Miami, Miami, Fla.

Architect-Engineer: Weed-Johnson Assoc., Miami, Fla.

Consulting Engineer: Norman J. Dignum & Assoc., Miami, Fla.

General Contractor: Rooney-Turner (Frank J. Rooney, Inc., Miami, Fla., and Turner Construction Co., New York, N. Y.)

Electrical Contractor: L. K. Comstock Co., Inc., Miami, Fla.

Westinghouse Distributor: Westinghouse Electric Supply Co., Miami, Fla.

Glenn Eaton, Florida Power & Light Co. power salesman, discusses the advantages of extra capacity built into Westinghouse building-type switchboard with William Bausch and Charles Butsch. Blank sections in foreground and spare circuit breakers have been allowed for future expansion.


Charles Butsch explains Westinghouse bus duct advantages to prospective tenant. Low-impedance bus duct carries incoming power to Westinghouse switchboard. Quiet, dependable Westinghouse DT-3 dry-type transformer (foreground) steps down voltage to utilization load. Main disconnect safety switches are Type CAF, 100- and 200-Amp.



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J-94122-4



New Miami bank building gets

13 floors of full power with Westinghouse bus duct

NO APPRECIABLE POWER LOSSES
FROM FLOOR TO FLOOR—CONVENIENT
PLUG-INS MAKE EVERY FLOOR A POWER STATION

"Power closets" on 13 floors of the new
First National Bank Building give
each floor *full electrical power*—with no
appreciable power loss even on the topmost level.

Convenient power-taps make every floor a power station.
No splicing or cutting—just plug into the
busway—take off full power.

The Westinghouse busway run in this new building
is over 550 vertical feet—supplies all of the lighting
power demands of the building, plus numerous
business machines. These three vertical rises
are 600-amp, 277/480-volt, 3-phase, 4-wire.

For the complete story on Westinghouse bus duct
for commercial or industrial buildings (low-impedance,
plug-in and Life-Line®), contact your nearby
Westinghouse sales office. Or write: Westinghouse
Electric Corporation, Standard Control Division,
Beaver, Pennsylvania.

J-30293



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WATCH "WESTINGHOUSE LUCILLE BALL-DESIARNAZ SHOWS" CBS TV FRIDAYS



Books

Parallel Reading for Consulting Engineers

According to the blurb on the dust jacket, *Life in the Crystal Palace* takes up where *The Organization Man* left off. If this is true, *The Organization Man* left off very close to the end, leaving little for Alan Harrington to say. More precisely, *Life in the Crystal Palace* is a case history, an example, of the conditions described and analyzed in William H. Whyte's earlier volume. It adds little that is new.

Alan Harrington has been working for a large corporation, in the public relations department, for several years. The company has been good to him. He has found his work pleasant if undemanding. But eventually, enough is enough, and he quits, dropping his mantle of corporate security to stand forth naked and unafraid against the world. The flaw here is that Harrington does not make it clear just what he has had enough of. Every now and then the reader feels that he is about to find out, but the explanation fades off into a grey mist having to do with Truth or Human Dignity. Harrington did go forth unafraid, perhaps, but he was not quite naked. He left the Crystal Palace only when he had secured a writing-fellowship from The Fund for the Republic.

Life in the Crystal Palace as described by Harrington is every bit as horrible as Whyte said, but Harrington is so anxious to be kind to his former employers who were so kind to him that he seems to be unsure of what he wants to say. He finds many little points to pick

on, but he never really succeeds in damning either the Crystal Palace or its people. Sometimes the reader gets the feeling that Harrington really liked his job so well that he is sorry he left. It is possible that if he recants just a little, the Personnel Reemployment Committee may act favorably on his application and take him back, reinstating both his insurance program and his pension plan.

Actually, Harrington's great sin is that of using a fellowship to expand a good magazine article into a full length book. He has stretched and stretched the little material he had, but the longer it gets the thinner it becomes. By the time it reaches book length, it is possible to see through it in several spots.

All manner of writing analyzing Communist China has been published recently to coincide with the tenth anniversary of that new nation. We can presume that all of the authors of these pieces write in the hope that they can clear up some of the misunderstanding and enlighten us somewhat concerning matters about which we in the West know almost nothing. If that is their hope — to clear up our confusion — then they have failed, for they seldom agree among themselves. We were nearly through *Impatient Giant — Red China Today*, when *Time* published a China issue (Oct. 12), and a careful reading of *Time's* story would lead one to believe that Mr. Luce's men and

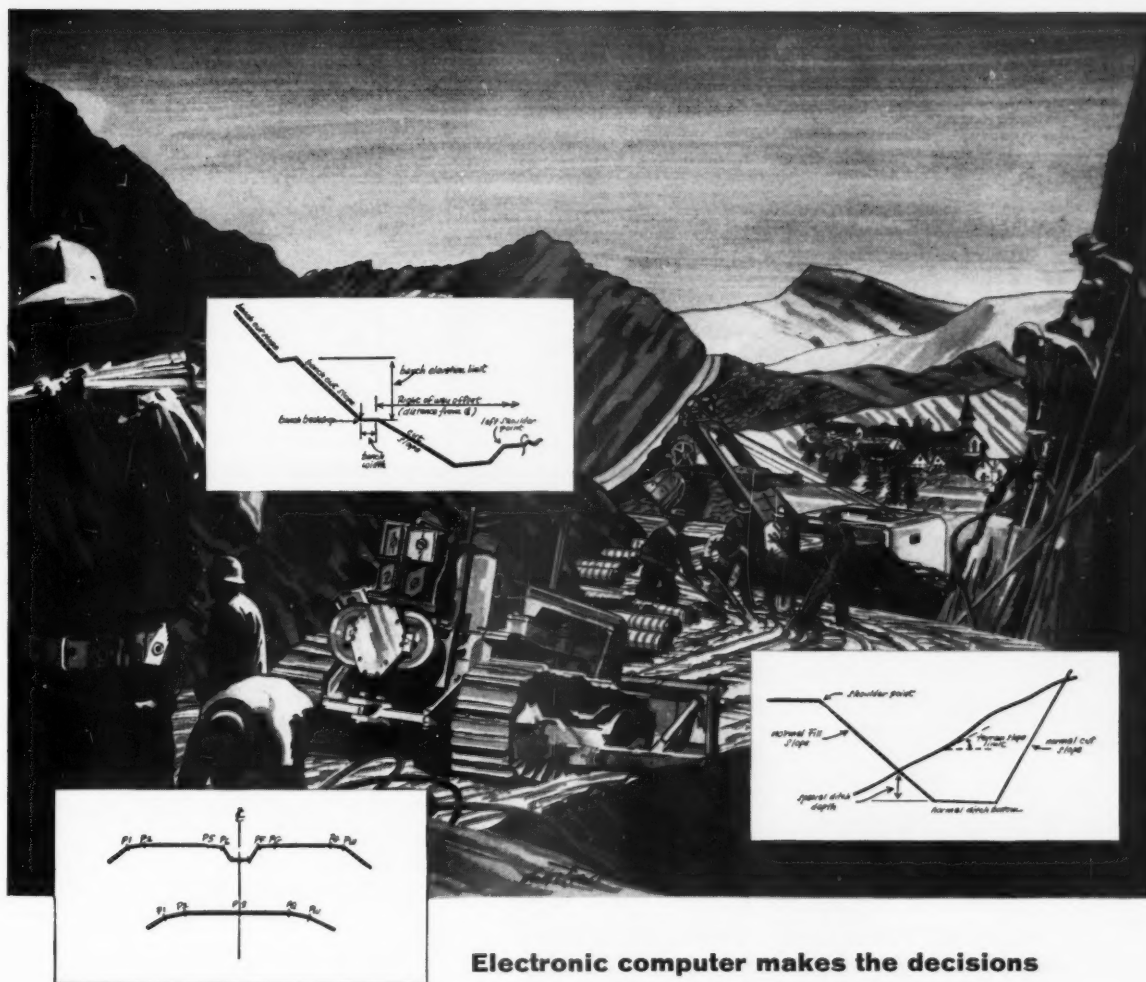
Gerald Clark somehow managed to end up in two different countries called China. The names of the leaders, Mao Tse-tung, Liu Shao-chi, and Chou En-lai, are spelled the same, but there the resemblance ends. And how are we to say who paints the better picture or what parts of each are true.

Gerald Clark is a Canadian, a correspondent for the *Montreal Star*. He is one of the few newspaper men to have spent much time in Communist China, and he is a competent reporter.

There are several points on which both Clark and *Time* agree. Both, for example, acknowledge that Mao is in charge. Both agree that the Chinese people are being driven by a propaganda campaign that is hysterical but effective. The reports differ in that Clark feels that if production figures are far less than those first predicted, they are still a success by any reasonable standard. *Time* calls the "great leap forward" a bumbling failure. Clark finds that the drive of the Chinese comes from patriotism — propaganda inspired, perhaps, but still patriotism. *Time* would see the Chinese as unwilling slaves responding only to the lash.

Without trying to determine how accurate Clark is in his analysis, we can agree with his conclusion that we must know more about this gigantic nation, and the only way we can learn is through the writings of many newsmen over a length of time. All too few qualified reporters have been permitted behind the bamboo curtain, and we cannot expect to understand what is going on in China until this is changed. This implies recognition of the Communist Government, which recognition Clark strongly favors. In any event, China — Communist China — is now a world power, and we cannot simply say it does not exist.

It is interesting to note that *Impatient Giant* is being published at \$4.50. We wonder how many Americans are interested enough at



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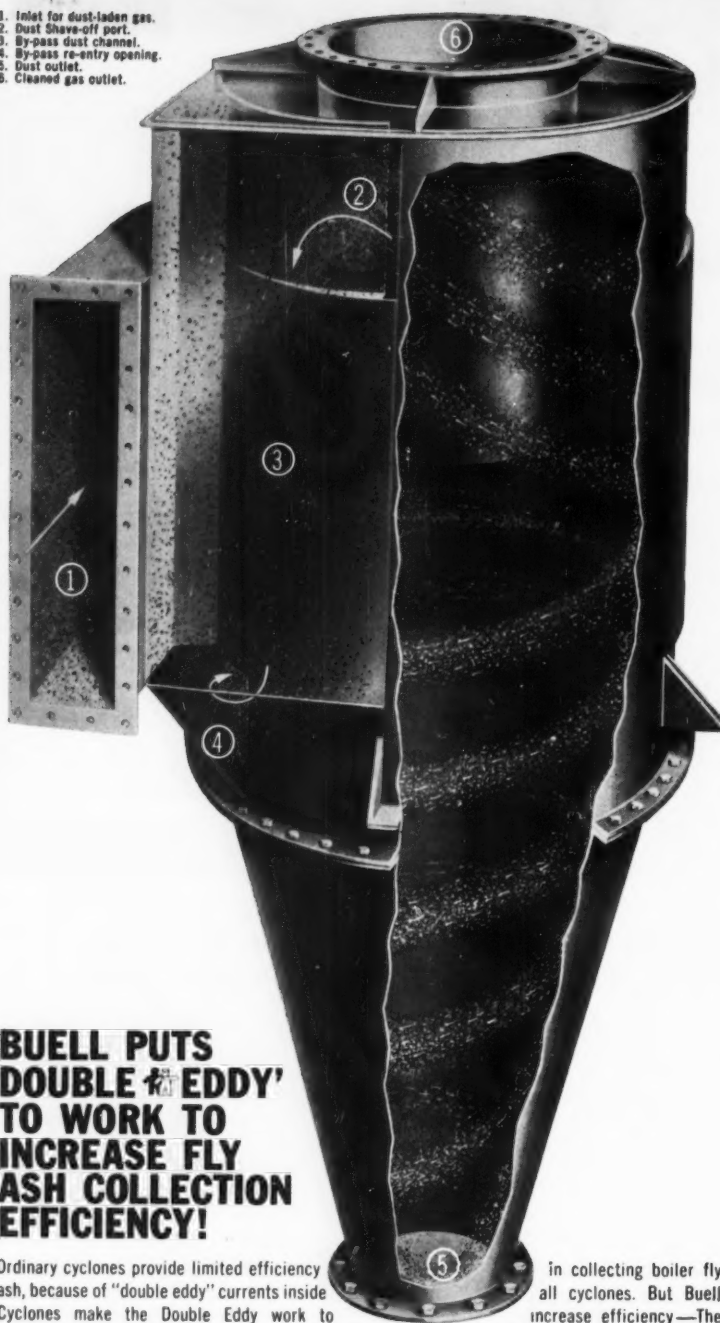
Royal Precision is jointly owned by the Royal McBee and General Precision Equipment Corporations. LGP-30 sales and service are available coast-to-coast, in Canada and abroad through Royal McBee Data Processing offices. For complete specifications on the LGP-30 and all the facts on the new highway design program, contact your nearby Royal McBee Data Processing Representative, or write
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this time to pay \$4.50 for a rather short book — actually a long article on a subject of current events. Is it not possible that something more logical than hard cover binding can be found for this kind of writing. Reporting is important and can be vital to our national well being, but not many persons are going to buy this book at this price and only a few will get it from libraries. No matter how accurate the reporting, the facts will be different in a few months. Some good publisher should recognize that writing of this important but temporal type deserves publication in paper covers at about \$.50 a copy, with newsstand and drug store distribution.

Books Reviewed in This Issue

Life in the Crystal Palace, by Alan Harrington; Alfred A. Knopf; \$4.50

Impatient Giant — Red China Today, by Gerald Clark; David McKay Co., Inc.; \$4.50.

New Technical Books

The efficient use of the modern business machine is as essential to the success of the small two- or three-man organization as it is to the larger consultant groups whose employees may number in the hundreds. With effective administration this apparent equality of business methods irrespective of size could be slanted in favor of the smaller group if the right equipment was used. Obviously the larger concerns can afford specialists, office managers, and the like, but the independent consultant and the member of a small partnership must do this on his own. Experienced office help, secretaries, file clerks, and typists have formed reliable opinions on standard items such as typewriters, adding machines, and ordinary duplicators, and, usually their judgment should govern. However, in the newer

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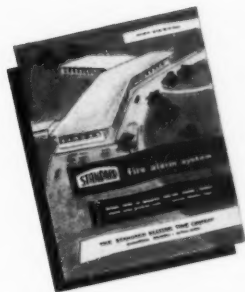


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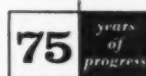
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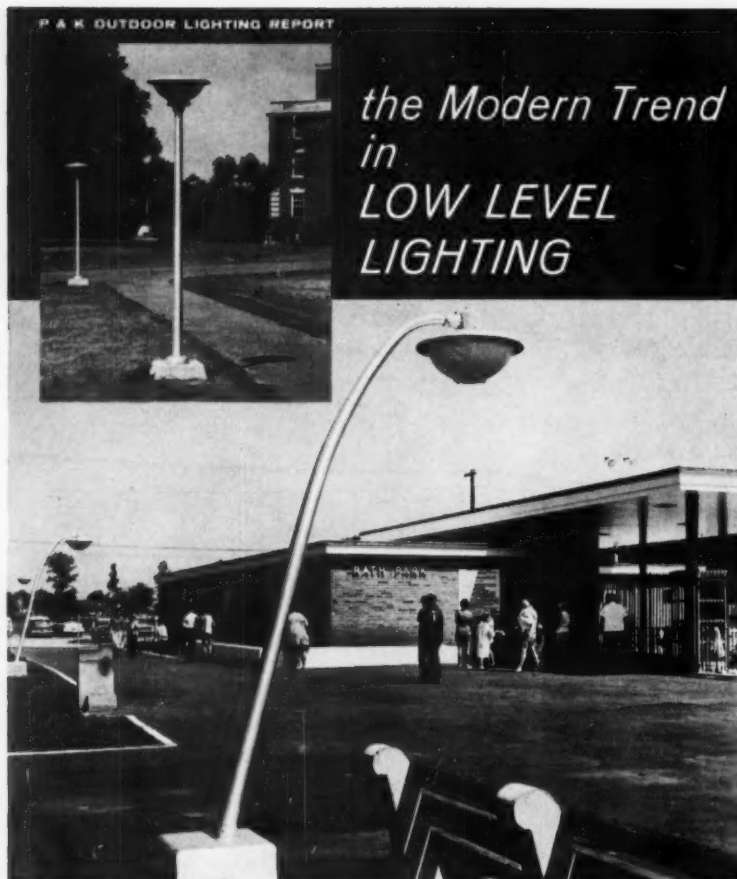
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The P&K CIRCLElux is available in a wide range of davit styles and mounting heights. The post is available in one basic design but at various mounting heights and with the CIRCLElux you have a choice of three light sources — incandescent, mercury vapor and fluorescent. This combination of luminaires and davits or posts will enable you to specify "packaged" lighting units. This means easier specifying by using matched components which in turn can customize your lighting projects.

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and possibly more expensive types of office machines such as the computer, automatic data processing devices, microfilming equipment, and large print duplicating machines, highly competent advice of an objective nature is needed. *Today's Business Machines*, published by the American Technical Society, Chicago, serves this purpose to a great degree.

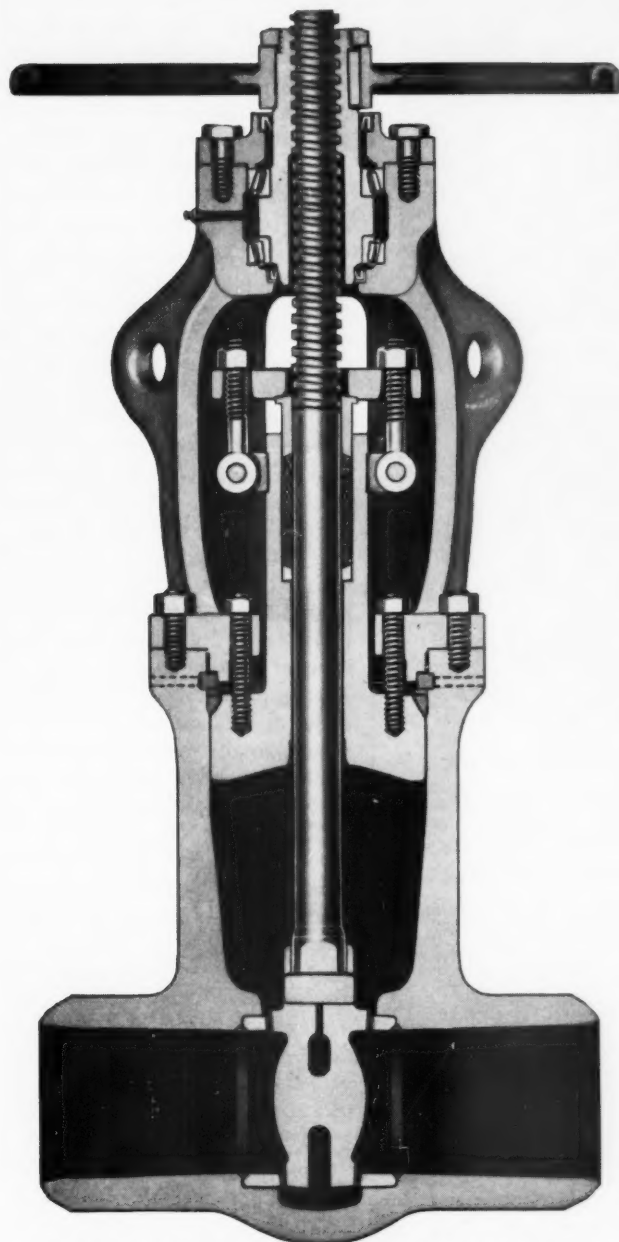
The author, Harrison Fisher, is in charge of the Business Administration Department of the American School, Chicago, and his experience there serves him well. His book is a survey of the entire field of business machines, techniques, and processes with not a little foresight into what is still in the development stage.

The chapter on Digital Computers is of special interest to consultants and the little exercise converting decimal counting to binary counting is a gem. Programming is reduced to its fundamentals which is unusual in a book on computers at this stage of the art. In fact, another chapter on this topic alone, with the same logical development continued, would cause many more consultants to make this book a permanent addition to their office library shelves.

LAMINATED PLASTICS, by D. J. Duffin; Reinhold Publishing Corporation, N.Y.; \$5.75. Although semi-technical in nature, this book is thorough enough to be of interest to anyone dealing with problems in laminated plastics. Beginning with the discovery of the phenolic resins, progress of the laminating industry is covered to date. Phenolic resin procedures are described, as well as those for polyesters, epoxides, silicones, teflon, and a number of others.

Of particular interest to the consultant are chapters on grades and characteristics of high-pressure laminates, as well as for heat resistant and other special types. Also of interest to engineers are the detailed appendices giving lists of

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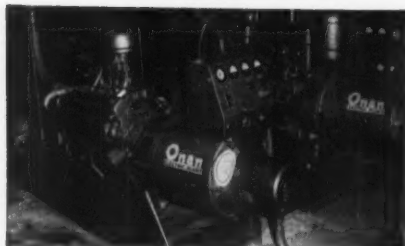


Where else in this hospital is standby power important?

Any list of critical areas or services would include elevators, heating system, respirators, aspirators, oxygen tents, communications, x-ray equipment and various kinds of pumps. Interruption of electric power to any of these could be as vital to the patient as failure of emergency or operating room lighting.

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manufacturers, trade names of various products, and a definition of terms in use by the industry.

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AN INTRODUCTION TO FLUID MECHANICS AND HEAT TRANSFER, by J. M. Kay; Cambridge University Press, New York; \$7.00. High-speed compressible fluid flow has emphasized the important inter-relationships between fluid mechanics, thermodynamics and heat transfer. In this area a great deal has been done to provide a unified approach to the solution of problems where the interplay of these three basic sciences is dramatically evident. In the area of incompressible and subsonic flow the traditional pedagogical approach, in which fluid mechanics, thermodynamics, and heat transfer are treated as three separate sciences with a minor amount of interlocking, has been the practice. This volume, which is evidently written for the practicing engineer, brings together the principles of fluid mechanics and heat transfer in a unified approach to solving problems where the principles of fluid mechanics is not restricted in any way to compressible or high-speed flow. The author presents the fundamental concepts of fluid flow, viscosity, heat conduction, diffusion, the energy and momentum principles, and the method of dimensional analysis. These ideas then are developed in terms of their applications such as flow in pipes and channels, pumps, compressors, and heat exchangers. In the later chapters, the author deals with the equations of fluid motion, turbulence, and general equations of forced convection. The final section discusses special problems in process engineering including compressible flow in pipes, solid particles in fluid flow, flow through packed beds, and condensation and evaporation.

This book should serve as a useful reference for a clear restatement of the basic principles of

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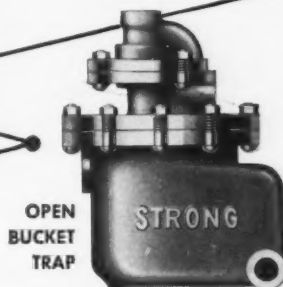
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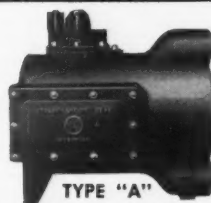
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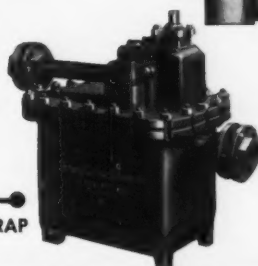
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Selector Chart in Strong Catalog No. 69A gives trap recommendations for 45 types of equipment. Write for your copy or call your distributor.



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fluid mechanics and heat transfer for either practicing chemical or mechanical engineers who are concerned with problems in the process industries. It also should prove to be a useful volume for nuclear engineers and other persons engaged in research in either the broad fields of heat transfer or fluid mechanics.

PROBLEMS IN ENGINEERING DRAWING, by Warren J. Luzadder; Prentice-Hall, Inc., N. Y.; \$3.95. This series of drawing problems is designed for use with "Fundamentals of Engineering Drawing" by the same author. Unfortunately, the publisher did not see fit to present both volumes to the public as a related package, so it is impossible to review their interrelated merit. However, this is a comprehensive presentation of training problems in all phases of engineering drawing and would be an excellent source of "brush-up" or "review" material for that occasional draftsman who prefers to be considered a consultant. It also is a good source file for drawing problems to be used for testing prospective candidates for assignments on the board or to assist the consultant who may want to improve the work of a few trainees on his staff. The book is a useful reference for the neophyte.

BALLAST APPLICATION GUIDEBOOK, by General Electric's Ballast Department; 1430 East Fairchild, Danville, Ill.; \$5.00. This new illustrated manual, the first of its kind in the fluorescent lighting industry, reviews the principles of ballast specifications for industrial and institutional applications, schools, residential, and outdoor plastic sign applications. The problems of installation and operation of fluorescent lighting and special applications such as clock signal systems are discussed in detail. For the consultant who is in this field even in a marginal or occasional sense, this book is a must.

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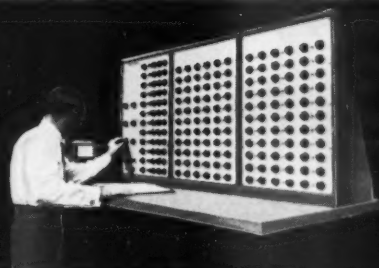
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24 pages of vital information involved in classroom lighting and lighting other school areas. Explains how much light students require for easiest study. Illustrates with photos and text the effects of glare and brightness. Gives recommended reflectance values for proper seeing conditions within classrooms.

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Many problems discussed in this book were solved by Smoot-Holman's advance design analogue computer. This new computer, the only one of its type ever built for commercial use, solves problems of fixture design, as well as many other problems in the field of lighting.



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The price includes supplementary material as it becomes available.

ELEMENTS OF REINFORCED CONCRETE, by Sylvan P. Stern; Prentice-Hall, Inc., N. Y.; \$10.60. The fundamentals of reinforced concrete design and detailing are presented in a competent and logical fashion, with a well planned balance of text and illustrative material. In addition, a complete design of the foundations for a steel frame build-

ing is detailed, step by step, and in accordance with the "building code requirements for reinforced concrete ACI 318-56" and using the new type ASTM A305 deformed concrete reinforcing bars. Not only does the reader or student familiarize himself with the code requirements and their applications but he applies current methods of detailing as used by contemporary consultants as well. This is not a handbook but is rec-

ommended for the reference shelves in the consulting engineer's office.

INFORMATION MEETING ON GAS-COOLED POWER REACTORS, TID-7564, \$3.50 and **REPORT OF THE FLUID FUEL REACTORS TASK FORCE**, TID-8507, \$1.75. Both books available separately from the Office of Technical Services, Washington 25, D. C. The first volume is a collection of papers on the subject, Gas-Cooled Power Reactors, presented at a meeting held at Oak Ridge National Laboratory during October of 1958. Among other things, it contains a description and comparison of the preliminary design and cost estimates for two power plants, one using natural uranium and the other enriched uranium. A review of British progress in this field beginning on page 119 is of particular interest.

The second volume is a report of the Task Force convened to evaluate the three fluid fuel reactor concepts under development by the Atomic Energy Commission. These three reactor concepts are the aqueous homogeneous - AHR, molten salt - MSR, and liquid metal fuel - LMSR. Both the immediate and long range objectives of the civilian nuclear power program are dealt with and the comparisons are on the basis of the following subjects:

- † Technical feasibility of fuels and materials
- † Design difficulties
- † Different approaches
- † Operational suitability
- † Maintenance
- † Reactor control problems
- † Potential hazards

An evaluation of breeding on the thorium U-233 cycle also is included. Both reports are necessary in the library of the informed power consultant.

SOIL MECHANICS AND EARTH STRUCTURES, by the Bureau of Yards and Docks, U. S. Navy (Order PB 151-613 from OTS, U. S. Department of Commerce, Washington 25,

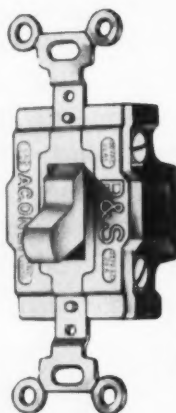
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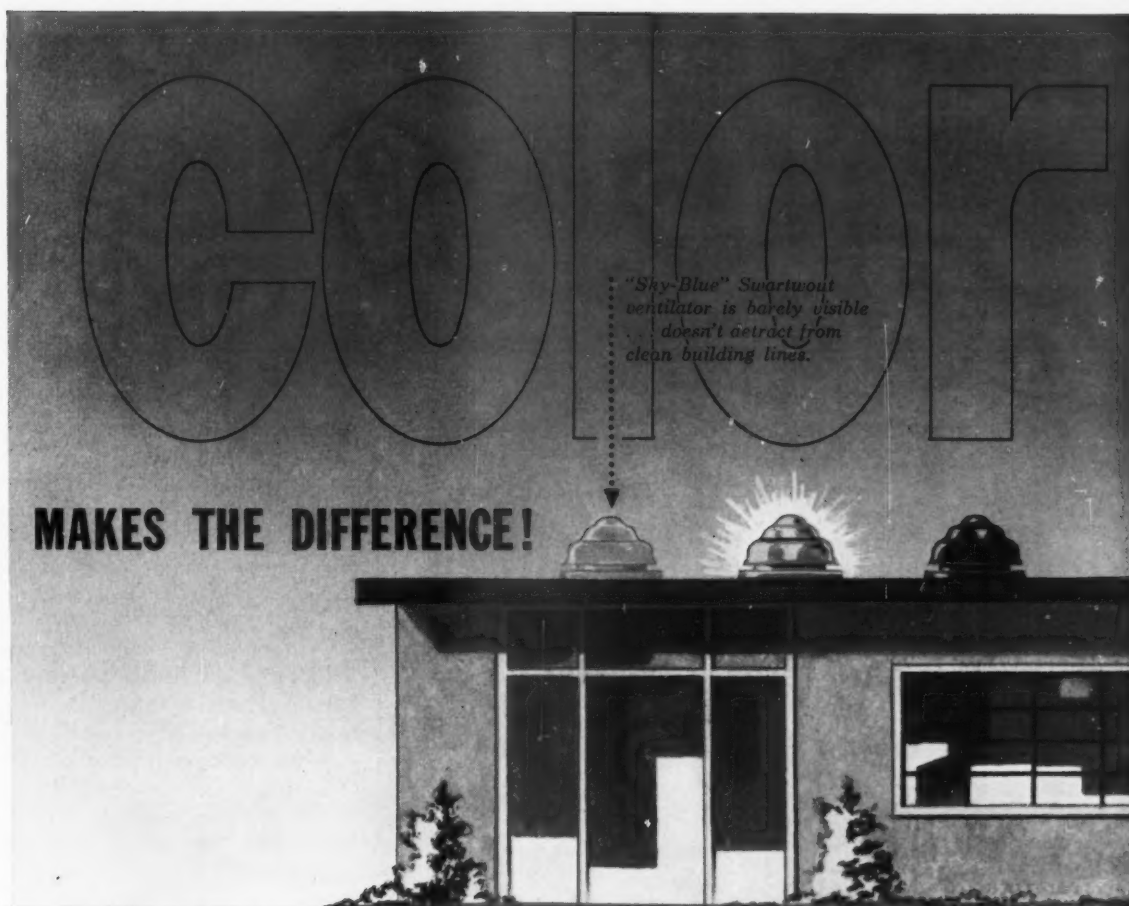
7310



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D. C.; \$2.75). Provides information to aid in obtaining the basic data on the structural properties of underlying soils. The field of basic soils engineering and its principles, such as the general requirements for soil data and exploration and the tests needed; and the elements of soil mechanics, such as earth settlements and stresses are included in the manual. The final section covers engineering principles and their applications to the

design and construction of earth structures, such as embankments, levees, and earth dams.

STEAM POWER PLANTS: STARTING, TESTING, AND OPERATION, by Charles Donald Swift; McGraw-Hill, N. Y.; \$11.50. Charles Donald Swift, a well qualified consultant in the power field, here presents a complete guide to steam power plants. Because of the broad informative area to be covered, gen-

eral principles are stressed rather than a stifling mass of detail. However, the author's 30 years of experience serves him well, and nothing essential to a thorough understanding of steam power plants from an engineering standpoint is left out. All classes of steam boilers and steam electric plants are covered as are the various modes of operation. The development of a steam power plant is followed from its inception and original design through to its first start-up. Personnel and facilities are organized, operating procedures are set up, and maintenance and test routines needed to keep the plant operating at an efficient level are provided. Some of this material has appeared in *Power* magazine.

STUDY OF DEEP SOIL STABILIZATION BY VERTICAL SAND DRAINS, by Moran, Proctor, Mueser & Rutledge; Bureau of Yards and Docks, U. S. Navy (Order PB 151692 from OTS, U. S. Department of Commerce, Washington 25, D. C.; \$6.00). This study was undertaken to develop factual correlations between actual and predicted performance of sand drains under the loads of fill placed on unstable foundation soils. Included is a section on design methods and procedures and guide specifications in discussion form which can be used in the preparation of particular job specifications.

NEW INSTRUMENTS AND METHODS OF ENGINEERING GEOLOGY, by N. V. Glazov and A. N. Glazov (translated from the Russian); Consultants Bureau, Inc., N. Y.; \$3.25. The Soviet authors present a concise review of new methods and equipment being used in the USSR and certain other foreign countries in the field of geological and hydrogeological engineering. The use of radioactive isotopes is investigated at length although the equipment detailed is quite rudimentary. As the authors state, this is to enable the reader to improve upon the

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POWER SAVINGS—Blast gate feature—exclusive with Spencer—permits controlled air delivery. Power is used only in proportion to air volume required.

COMPLETE DEPENDABILITY—Simple, rugged construction (lightweight impellers the only moving parts) ... absence of vibration ... no belts, gears or other intricate mechanisms that require frequent adjustment or repair.

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LOW FIRST COST—No special foundations ... no bolting down or grouting required.

The **SPENCER**
TURBINE COMPANY
HARTFORD 6, CONNECTICUT

MAN-SIZE WASHING JOB



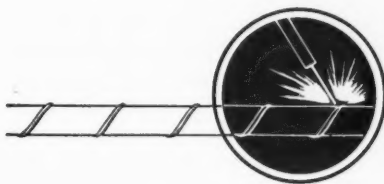
Naylor Spiralweld pipe was selected for this unusual project where a large volume of water was required for grading gravel.

With good reason, too. Here is pipe that provides light weight without sacrifice of strength, due to its exclusive spiral-lock-seam structure. It's easier to handle and install—particularly when combined with the one-piece NAYLOR Wedgelock cou-

pling which requires only a hammer to assemble or knock down. This combination adds up to faster installation and all-round economical performance.

For water, dredging, air or ventilating service, it will pay you to consider these NAYLOR advantages for your lines.

Write for Bulletin No. 59.



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equipment in the process of conducting his work.

AMERICAN PETROLEUM REFINING, by H. S. Bell; D. Van Nostrand Company, Inc., Princeton, N. J.; \$12.50. H. S. Bell, a consultant in private practice, is an outstanding authority in his field. This is the fourth edition of this book which is a standard reference in the industry. He is a good writer and over the years his organization of

material and carefully researched historical background has proved adequate. Bell avoids deep theoretical discussions and lengthy detail which can be obtained elsewhere. This is an over-all picture of the refining industry brought up to date, appropriately published in centennial year of the oil industry.

CORROSION OF CHEMICAL APPARATUS, by G. L. Shvartz and M. M. Kristal (translated from

the Russian); Consultants Bureau, Inc., New York, N.Y.; \$7.50. Valuable data concerning the theory of intercrystalline and stress corrosion is presented here along with the detailed causes and character of corrosion cracking of carbon steels, alloyed steels, and nonferrous metals. This information is based not only on the authors' extensive studies of specific cases in Soviet industry but also on recent literature in the field, including 219 references most of which are in Soviet publications. Practical recommendations on methods of preventing and protecting against corrosion cracking and intercrystalline corrosion of metals and alloys are contained in this book.

AN INTRODUCTION TO CHEMICAL ENGINEERING, by Littlejohn and Meenaghan; Reinhold Publishing Corp., New York; \$7.80. Intended primarily as a beginning text for students in chemical engineering and related professions, this book presents material that must be mastered before unit operations and thermodynamics is begun. It is devoted to explaining some of the fundamentals on which chemical engineering theory is based.

Among the sections relating to chemical engineering specifically is an altogether too brief discourse on the profession of engineering in general. Included is Registration of Engineers, the Professional Societies, and an explanation of Ethics that includes the Engineers' Joint Council statement "The Faith of the Engineer" and an excerpt from the Canons of Ethics.

THE DIESEL ENGINE, by L. V. Armstrong and J. B. Hartman; The Macmillan Co., New York, N.Y.; \$8.75. In a comprehensive and logical treatment of the diesel engine this book reflects the authors' extensive experience. A discussion of petroleum and refining methods is followed by a consideration of diesel fuel combustion. Then the effect of the forces released by

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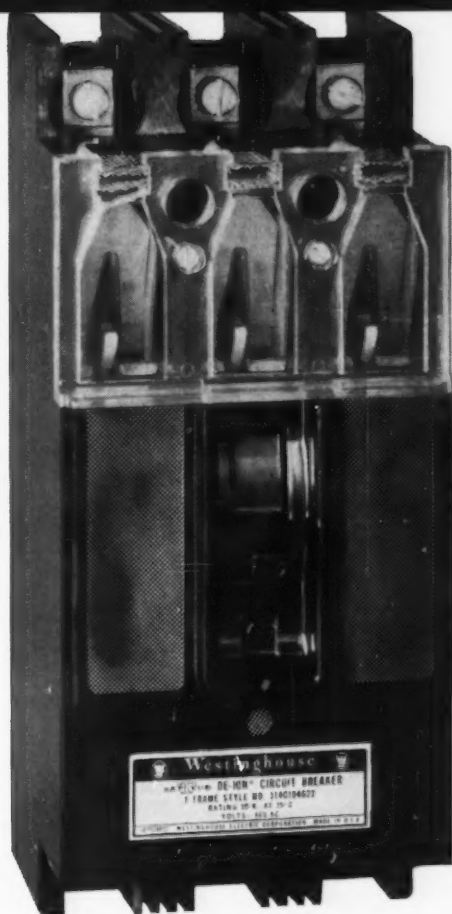
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combustion upon the moving parts of the engine is discussed. After that follows a treatment of "parasitic engine parts" and finally, there is a section on economics, including power application. A consultant in the power plant design field would find this a welcome addition to his reference shelves.

FOUNDATION DESIGN AND PRACTICE, by J. H. Thornley; Columbia University Press, New York, N.Y.; \$15.00. Many structural foundations continue to cost far more than they should and in this book the author sets out to remedy the situation. Its purpose is to help the consultant chose the correct and most economical foundation for a given structure without in any way reducing its safety. Thornley has organized his book in six parts: The Preliminaries, Foundation Types, Laboratory and Field Testing, Specification and Contracts, Building Codes, and Basic Design. Each subject is adequately covered

and illustrated. The author's 40 years of experience in engineering and contracting is utilized well.

HOW TO INVENT, by Forrest E. Gilmore; Gulf Publishing Co. Houston, Texas; \$2.50. Every consultant who has at least five clients to his professional name has among them at least one who has a "million dollar idea" that needs "just a little more development" or perhaps wants some advice on "how to protect his invention." Sometimes he may even be a little paternal and want to "give you some help" from his vantage point as the customer. In any event, however well intentioned he may be, he does need some accurate if informal advice on the subject of inventing and inventions and this is the book to loan him. The chances are it will go through several hands before being returned.

In just 90 pages all the fascinating aspects of inventing are briefly and engagingly discussed.

All the layman's questions are answered and the old adage "10 percent inspiration and 90 percent application" is treated with due respect. The Creative Mind, Brainstorming, Intuition and Imagination, Setting the Stage for Illumination and Inspiration are some of the subjects covered. The several cartoon illustrations maintain the light tone of the book.

Needless to say, the consultant will enjoy this little volume but continue to get his patent advice from his attorney and his inspiration from his work.

DESIGN OF INDUSTRIAL EXHAUST SYSTEMS, by John L. Alden; The Industrial Press, New York, N.Y.; \$6.00. The purpose of this book is to explain how to design, build, or buy industrial systems that will adequately and economically perform the functions required by law or prescribed by specialists. No attempt is made to cover the broad fields of health hazards, industrial dusts, or the pathological phases of industrial hygiene. Alden brings this, his third edition, up to date with complete coverage of the latest developments including fog filters, reverse flow filters, venturi scrubbers, and the increased application of multiple miniature cyclones. For over 20 years this has been a standard reference.

HANDBOOK OF AIR CONDITIONING, HEATING, AND VENTILATING, edited by Clifford Strock; The Industrial Press, New York, N.Y.; \$15.00. The object of this handbook is to provide consultants, contractors, and others in the field with the kind of information they need almost daily, and to present it in the most convenient, time-saving manner possible. Keeping this aim in mind, emphasis is placed wherever possible on data in the form of tables, formulas, graphs, and maps that will be immediately useful in solving problems of design, installation, and operation. Technical and editorial quality are consistently

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AND
MECHANICAL
SEALS



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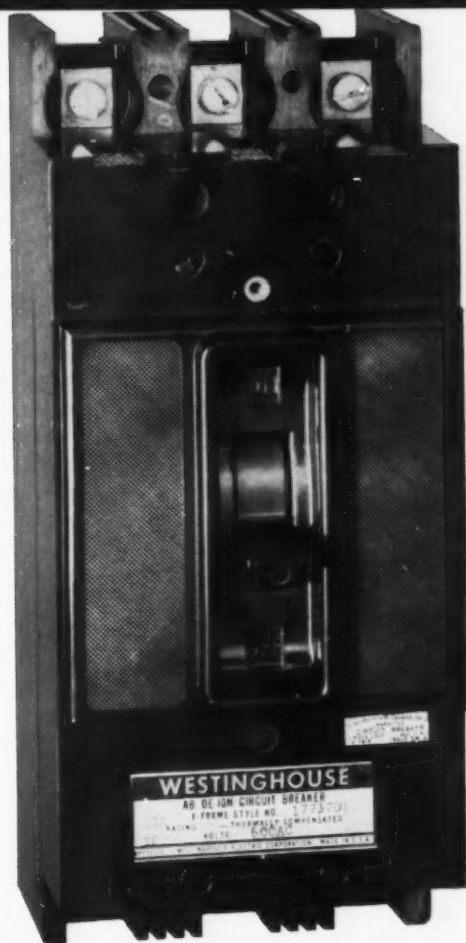
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high throughout the book and the indexing of material is excellent.

Among the several new inclusions in a handbook of this type is one that was accomplished with the cooperation of the U. S. Weather Bureau. This is the most complete collection of climatic maps ever attempted in this field giving heating and air conditioning design temperatures; cooling degree hours; sunshine, snow, dry and wet bulb temperatures; ground water temperatures; and many others. Degree-day data also is mapped in detail for all of North America and tabulated for 1228 U.S. and 42 Canadian localities.

KINETICS OF HIGH TEMPERATURE PROCESSES, by W. D. Kingery; The Technology Press & Wiley & Sons, New York, N.Y.; \$13.50. This book is concerned with the study of the kinetics of condensed phase processes at elevated temperatures. It is the result of a conference on the subject held at MIT's Endicott

House in June of 1958, the purpose of which was to bring together the diverse interests and points of view of the many competent scientists and consultants working on the subject.

While it is true that the arrangement of the book's material into seven parts is, in this case, rather arbitrary, it does represent the primary areas of interest of individual contributors. In Part I, several papers on imperfections and diffusion in nonmetals indicate that the experimental data and our understanding of these problems are expanding but several areas still must be investigated thoroughly.

In contrast, in Part II, diffusion in liquid systems is not as well understood, and few reliable data are available. Phenomena of nucleation, grain growth, and sintering discussed in Parts III and IV have been intensively studied in the past several years and the major phenomena and problems seem to be well defined but not completely

understood. Many aspects of phase transitions, Part V, solid reactions, Part VI, and solid-gas reactions, Part VII, seem to be clear in their broad outline, but as more detailed qualitative data become available, it is evident that a more sophisticated view must be taken for many real systems.

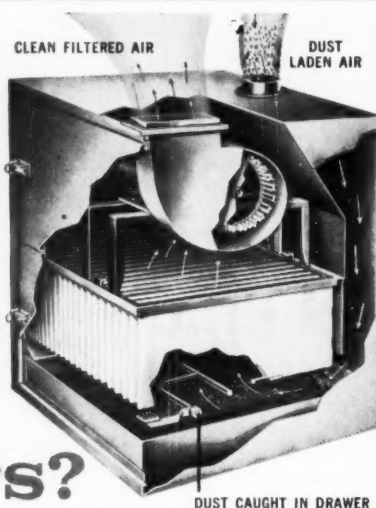
This book must be considered a significant contribution to the design of high temperature processes and equipment. The conference was sponsored in part by the U.S. Air Force under contract with the Aeronautical Research Laboratory, Wright Air Development Center.

ARTICLE REPRINTS

For free copies of reprints listed below, write on company letterhead to Reader Service Dept., CONSULTING ENGINEER 217 Wayne St., St. Joseph, Mich.

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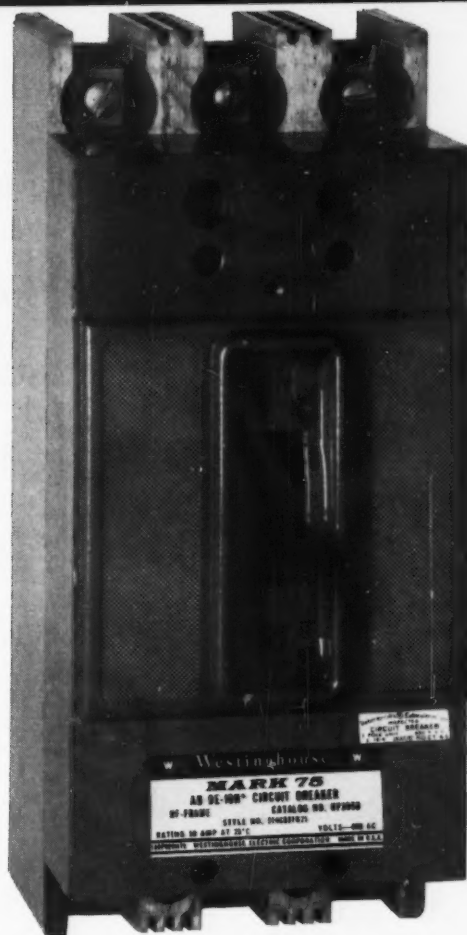


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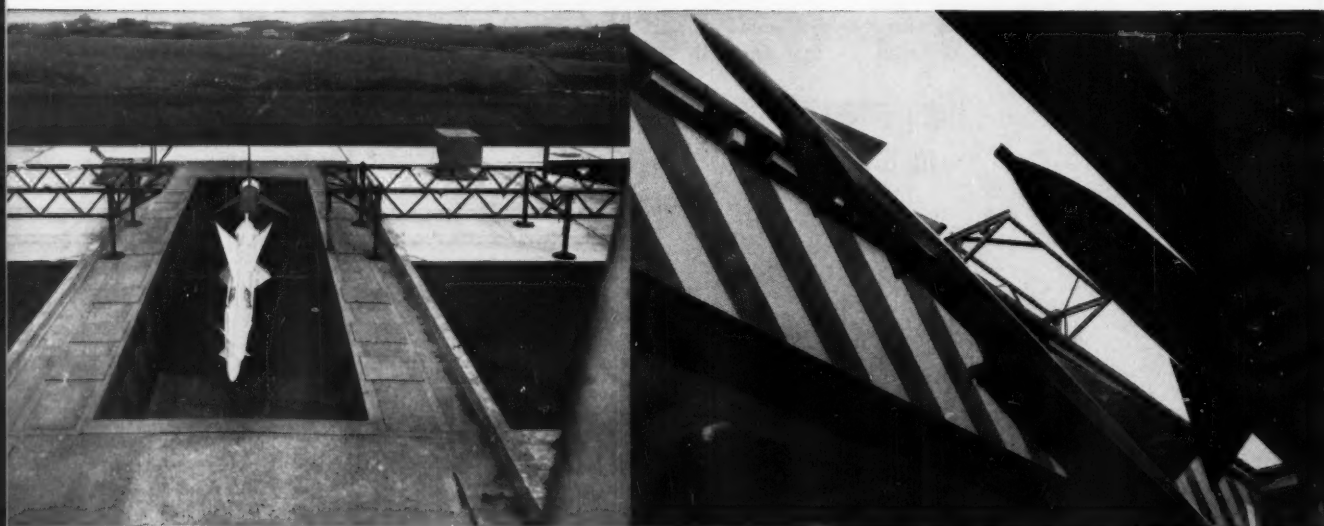
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About the earthly side of the Nike Ajax.

The U. S. Army's Nike Ajax is a strange but potent bird. Graceful, tough, packed with delicate instruments. He will fly only once in his lifetime—only in the event of an enemy attack. To launch him with split-second timing and accuracy, the Army puts most of its manpower and most of its materials into ground equipment. And virtually all the material required other than electronic equipment can be purchased from one firm—United States Steel. Whether you're talking about carbon steel, high-strength low-alloy, or ultra high-strength alloy steels, Stainless Steel, steel fence,



The Nike Ajax spends his days in a concrete and steel nest like this one. ICBM's will also live this way, but in nests that will take *thousands* of tons of concrete and steel. U.S. Steel specialists work continually with designers and construction engineers to find ways to use steel to its full advantage on such projects to build stronger with less materials . . . to build them faster.

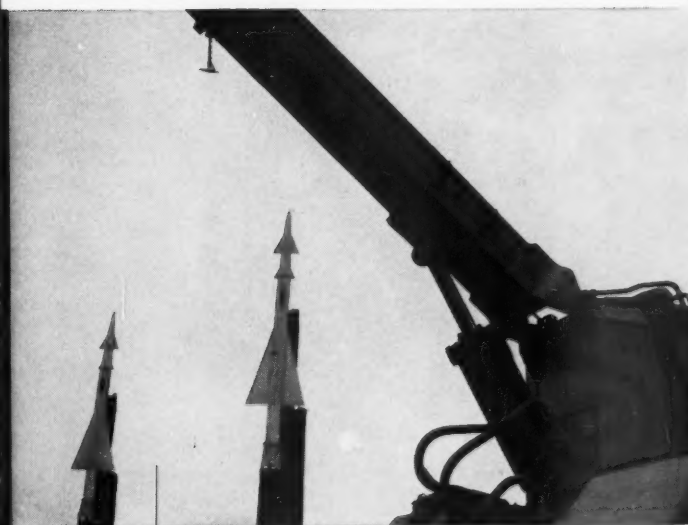
It takes miles of wire and cable to rig a Nike nest. It will take *hundreds* of miles when bigger birds are put to roost. The Army uses many types of steel and steel products in a Nike nest. U.S. Steel conducts research and knows how to cut costs for any steel product used in ground support equipment.

electrical cable, cement or wire rope, United States Steel maintains the technical services to provide the proper assistance to cope with any problem on materials for ground equipment. When a ground support program goes to the drawing board, consult with

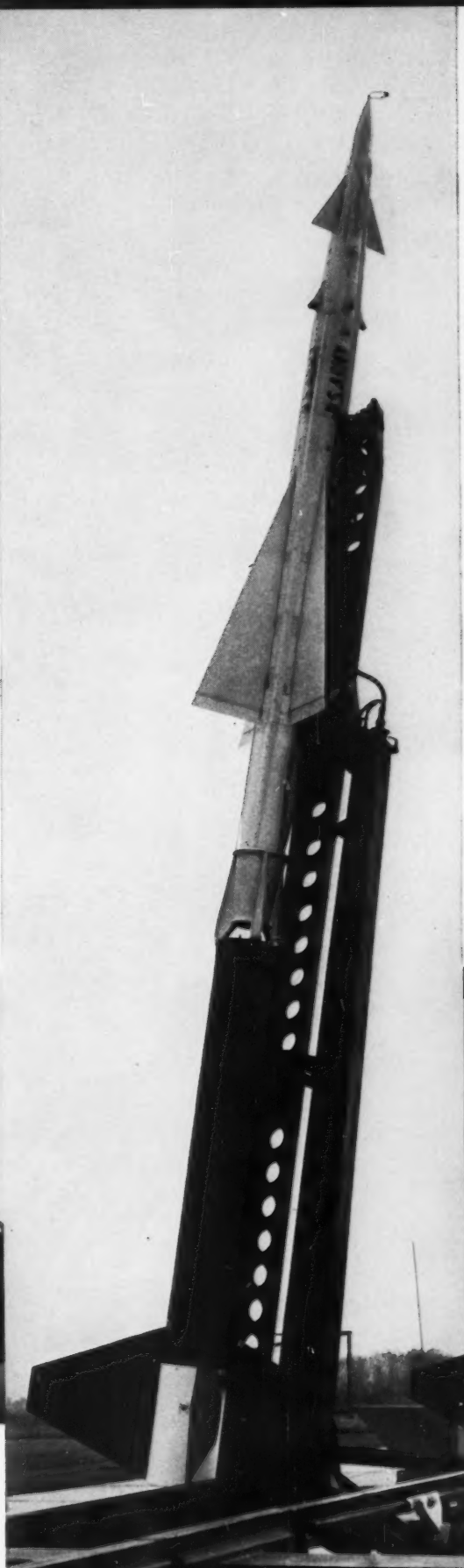


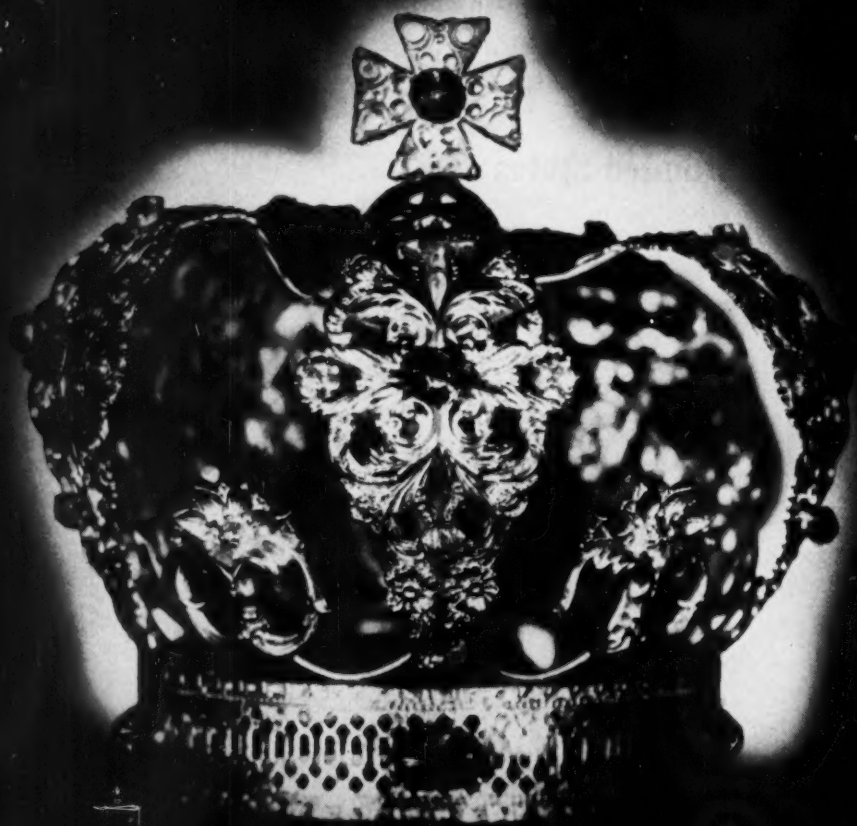
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Corona means crown. It can also mean trouble for ordinary high-voltage cable—because corona is also the name for a low-energy electrical discharge (the glow around the crown at left) which actually cracks and splits ordinary rubber insulation. How? By ionizing any air in between and around conductor and insulation, it creates ozone, ultraviolet light, and certain nitrogen compounds.

And ozone, for example, works itself into ordinary rubber insulation and splits the long-chain rubber molecules. In time you see the costly result—cracked insulation and cable failure.

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Butyl—the most effective rubber insulating material ever developed—has inherent resistance to ozone. And—to aging, moisture, and heat.

But—butyl handles differently from other rubbers. Additives, usually in the

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This specialized manufacture and specialized inspection, test and quality control are part of the reason why Anaconda Butyl (AB) Cable means long-range economy and reliability, and why you should specify (AB) to protect your investment in high-voltage cable.

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and many entrances
need



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New Projects Reported

By Consulting Engineers

ALABAMA

Drake and Funsten

Atlanta, Georgia

¶ Investigation of short span bar joists and presentation of and acceptance by Steel Joist Institute. (struc.) Client, M & S Steel Co., Ft. Payne, Ala.

ARKANSAS

J. S. Boyd and Associates

Shreveport, Louisiana

¶ Water distribution system, water well, and elevated storage tank. (struc., civil) \$115,000. Client, Town of Bradley, Ark.

CALIFORNIA

Ruth & Going

San Jose, California

¶ Report on water pricing policies of various political subdivisions in Santa Clara, Alameda, and San Benito Counties, California. (civil) Client, Tri-County Water Authority.

Wilsey and Ham

Millbrae, California

¶ Design and prepare preliminary plans for flood control project in Compton, California. \$545,000.

Thomas G. Atkinson

San Diego, California

¶ Rose Canyon operating station, public work shops & offices, automotive equipment servicing facilities, San Diego, Calif. \$182,000. Client, City of San Diego.

COLORADO

Arrowhead Engineers, Inc.

Denver, Colorado

¶ Office and warehouse, Gamble-Skogma Co. (struc., civil, mech., elec.) \$650,000. Client, Leon Brin, architect and Gamble-Skogma Co.

¶ Design heating plant, mechanical and electrical facilities, Alamosa Community

Hospital. (mech., elec.) \$750,000. Client, Alamosa Community Hospital.

¶ Lakeside National Bank. (struc., civil, mech., elec.) \$100,000. Client, Leon Brin, architect and Markets, Inc.

¶ Gold Bond Stamp Co. office and warehouse. (struc., civil, mech., elec.) \$500,000. Client, Leon Brin, architect and Gold Bond Stamps.

¶ Apartment building, 20-unit, Denver, Colo. (struc., elec., mech.) \$200,000. Client, 1912 Corporation.

Uri Seiden and Associates

Kansas City, Missouri

¶ Denver office building, Denver, Colorado, four-story, steel framing. (struc.) \$500,000. Client, Fullerton & McCamis, architects.

CONNECTICUT

Loomis & Loomis

Windsor, Connecticut

¶ Farmington Avenue shopping center, New Britain, Conn. (struc.) \$300,000. Client, P. Di Corcia Associates, arch.

FLORIDA

Marion Engineering Associates, Inc.

Ocala, Florida

¶ Ocala Municipal Airport, new location. Joint venture with Howard, Needles, Tammen & Bergendoff. (civil) \$650,000. Client, City of Ocala, Florida.

Maurice L. Eisenberg, Designer

Miami, Florida

¶ Fifty one-bedroom apartments on piling, North Miami, Florida. \$360,000. Client, Harry Rose.

Smalley, Wellford and Nalven

Sarasota, Florida

¶ Florida Quadricentennial Exhibition buildings. (struc., civil, mech., elec.) \$80,000. Client, Spear, Inc.

¶ Water supply, sanitary sewage disposal, industrial sewage disposal, Elec-

HIGH AND DRY!
...not way down in the pit



Twin installation of Model 14A2-B at a sewage treatment plant, Clair-Mel City, Tampa, Fla. Controls alternate pumps at regular intervals.

GORMAN-RUPP SEWAGE PUMPS

COST LESS TO BUY—Self-priming in lifts up to 15', positive in action, nearly completely non-clogging. High and dry, their installed cost has allowed savings of as much as 50%.

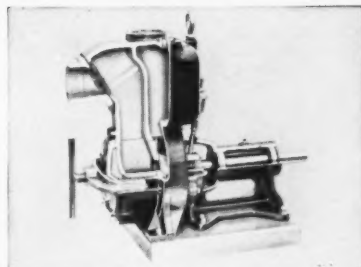
COST LESS TO MAINTAIN—Almost no maintenance needed! No need to service by entering pit or raising pump. Just a turn of the wrist and the end plate is off.

PERFORM WHERE OTHERS FAIL—In lift stations and sewage plants, these Gorman-Rupp units have shown amazing records of savings . . . operating where others have failed. Let us show you examples.

2", 3", 4" and 6" pumps—connected to your power or ordered complete with power units. Write for complete specifications.

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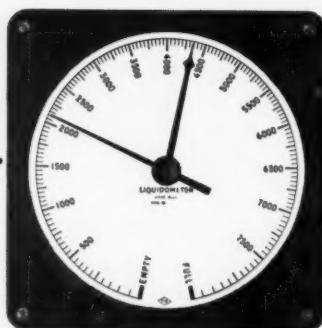


FAST-ACTION END PLATE—Exclusive end plate releases for access to impeller and wear plate. Two-vane open impeller specifically designed for handling spherical solids.





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THE LIQUIDOMETER CORP.
LONG ISLAND CITY 1, NEW YORK

tro-Mechanical Research, Inc. (struc., civil) \$120,000. Client, Permutit Co.

GEORGIA

Drake and Funsten

Atlanta, Georgia

¶ Utilities, water, gas, sewer, sewage lift station, and storm drainage for shopping center. (civil, mech.) \$30,000. Client, Sandy Springs Plaza, Inc.

¶ Design foundations and retaining walls for new brick drying plant. (struc., civil) \$50,000. Client, Brickerstaff Clay Products Company.

¶ Warehouse building, Nottingham Oil Co., Atlanta. (struc., civil, mech., elec.) \$50,000. Client, G. R. Nottingham.

HAWAII

Montgomery & Kohloss, Inc.
Honolulu, Hawaii

¶ Additions and alterations to Honolulu Academy of Arts, Honolulu. Air conditioning, plumbing, and fire protection systems. (mech.) \$450,000. Client, Albert E. Ives, architect.

¶ Office and parking building for Bishop National Bank of Hawaii, Honolulu. Air conditioning, fire protection systems, plumbing, electrical. Joint venture with Ferris & Hamig, St. Louis, Mo. and Wynn Nakamura, Honolulu. (mech., elec.) Client, Lemmon, Freeth, Haines & Jones, architects.

¶ Atkinson Towers, Waikiki, Honolulu. 15-story cooperative apartment building. Plumbing, elevators, ventilation, and fire protection. (mech.) \$1.5 million. Client, Lemmon, Freeth, Haines & Jones, arch.

¶ Commissioned officers mess, U.S. Naval Base, Pearl Harbor, Hawaii. Air conditioning, refrigeration, ventilation, plumbing, and site utilities. (mech.) \$750,000. Client, Johnson & Perkins, & Preis, architects.

¶ Hangar, shops, offices, and quarters, Hawaii Air National Guard, Hickam Air Force Base, Honolulu. Fire protection, pumps for sewage, air conditioning, food service equipment, plumbing, ventilation. (mech.) \$2.2 million. Client, R. M. Towill Corporation, engineers.

¶ Shops, warehouses, and other facilities for Hawaiian Telephone Co., Moanalua Oahu, Hawaii. Interior fire protection, industrial exhaust systems, hydraulic lifts, air conditioning, plumbing, ventilation. (mech.) Client, Belt, Lemmon & Lo, architects and engineers.

INDIANA

Thomas-Allen & Associates, Inc.
Danville, Indiana

¶ Subdivision, Danville, Indiana. (civil) \$225,000. Client, Harold Martin and Richard Duzan.

¶ Subdivision, Brownsburg, Indiana. (civil) \$750,000. Client, Fred Hopkins.

Nachman, Vragel & Associates
Chicago, Illinois

¶ Design and supervision of mechanical and electrical facilities for East Campus,

3 NEW G-E MOTORS AND 42 QUALITY IMPROVEMENTS

A family appearance in power station motors and 42 basic design improvements are now available from General Electric. The three new enclosures shown here enable electric utilities to select power station motors with the same modern appearance. And all of these new motors contain the same advanced features, painstakingly engineered to meet electric utility standards of reliability.

Among the 42 quality improvements available on all G-E boiler feed pump motors, are:

- **Polyseal* insulation system**—sealed against moisture; resists fly ash, most other abrasives.
- **Patented tying system**—heat hardened Permafil glass rovings hold end turns of form wound coils in a vise-like grip for maximum support.
- **Rugged frames**—provide added rigidity and strength required for power station service.
- **Extremely low noise level**—now possible with proven acoustic treatment.
- **Stator connections**—all brazed for more uniform strength, reliability.
- **Controlled slot wedging**—provides tight, stable fit, virtually eliminates coil looseness and resultant wear.

FOR THE COMPLETE STORY on G.E.'s 3 new power station motors and 42 quality improvements, contact your G-E Apparatus Sales engineer or write Section 884-3, General Electric Co., Schenectady 5, New York.

*Trademark of General Electric Co.

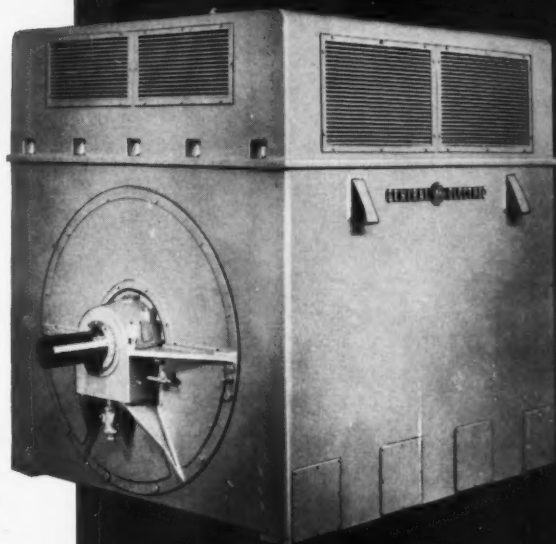
Progress Is Our Most Important Product

GENERAL  ELECTRIC

another G-E
PROJECT
'8000'
development

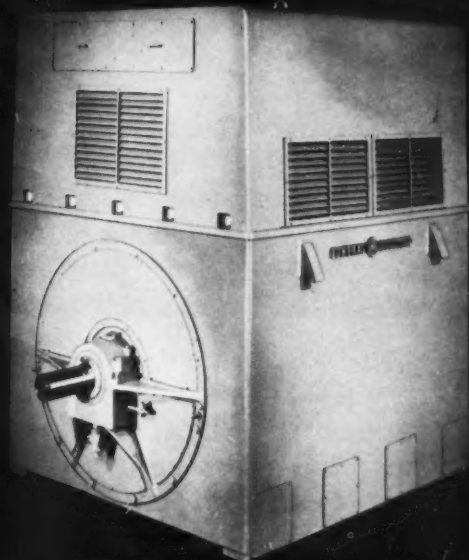
G-E TUBE-COOLED TEFC MOTORS—are designed for easy disassembly, maintenance and inspection; computers select optimum number, size and arrangement of tubes for most effective ventilation.

PROJECT '8000'—a major General Electric program of research, product redesign, advanced manufacturing and improved customer service on a-c motors 150- to 6000-hp.



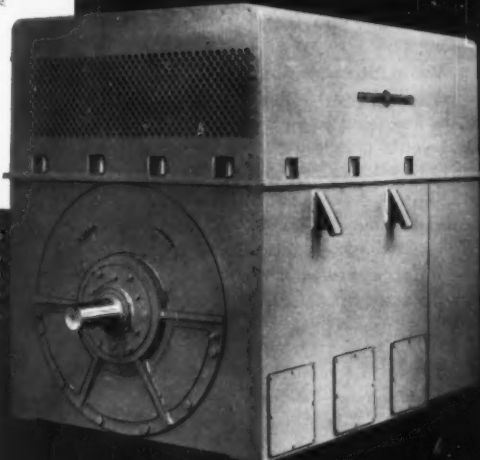
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Large 2-pole dripproof motors are acoustically treated for quiet operation—give long, reliable service.



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give better protection against rain, snow—even hurricanes—exceed NEMA Type II definition.



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Convactor Radiators
Catalog Nos. 4049-A
& 4150

Permaheat®
Baseboard Convectors
Catalog No. 4354-A

Valparaiso University, Valparaiso, Indiana. \$450,000.

KANSAS

Uri Seiden and Associates
Kansas City, Missouri
¶ Meadowlane school addition, Olathe, Kansas, one-story, steel framing. (struc.) \$25,000. Client, Frangkiser & Hutchens, architects.

¶ Valley View elementary school addition, Johnson County, Kansas, one-story, steel framing. (struc.) \$50,000. Client, Frangkiser & Hutchens, architects.

¶ Apache elementary school addition, Overland Park, Kansas, two-story, steel framing. (struc.) \$120,000. Client, Frangkiser & Hutchens, architects.

LOUISIANA

J. S. Boyd and Associates
Shreveport, Louisiana

¶ Sewage collection system, two lift stations, and oxidation pond. (struc., civil) \$190,000. Client, Town of Chatham, La.

¶ Water distribution system and elevated storage tank. (struc., civil) \$445,000. Client, Caddo Parish Waterworks District #3, Shreveport, La.

¶ Sewage collection system, lift stations, and treatment plant. (struc., civil) \$1.1 (est.) Client, Caddo Parish Sewer District #4, Shreveport, La.

J. J. Krebs & Sons

New Orleans, Louisiana

¶ Sewage treatment plant for subdivision of 1500 people. Plant will be enclosed within a house contemporary to those constructed on subdivision. Jefferson Parish, La. \$105,000. Client, Manuel Fisher and Edward McCarthy.

MARYLAND

Dowon Engineering Service, Inc.
Baltimore, Maryland

¶ Environmental test chamber. (production engineering) \$100,000. Client, The Martin Company.

Daniel Koffler & Associates
New Castle, Delaware

¶ Report of structural analysis of reinforced concrete industrial building, Elkton, Maryland. (struc.) Client, Textured Yarn Company.

MASSACHUSETTS

Albee, Harrold & Hirth
Braintree, Massachusetts

¶ New manufacturing plant and office, Ainslie Corporation, Braintree, Mass. (struc.) \$200,000. Client, Ainslie Corp.
¶ Braintree junior high school, Braintree, Mass. (struc.) \$1.5 million. Client, Rich & Tucker Associates, architects.

¶ Alterations and additions to existing manufacturing plant, Russell, Mass. (struc.) \$100,000. Client, D. O'Connell's Sons, Inc., general contractor.

¶ Gymnasium building, Thompson Academy, Thompson Island, Boston Harbor.



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Electricity flows through the new Time & Life Building. Few who see this new structure will ever realize the electrical engineering skill, the man-hours, the material and the effort involved to power this new land-mark. We are proud to have helped make this possible."

Joseph H. Rao

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and
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Architect: Harrison & Abramowitz & Harris
Engineer: Syska & Hennessy



JOSEPH W. RAO
President & Founder

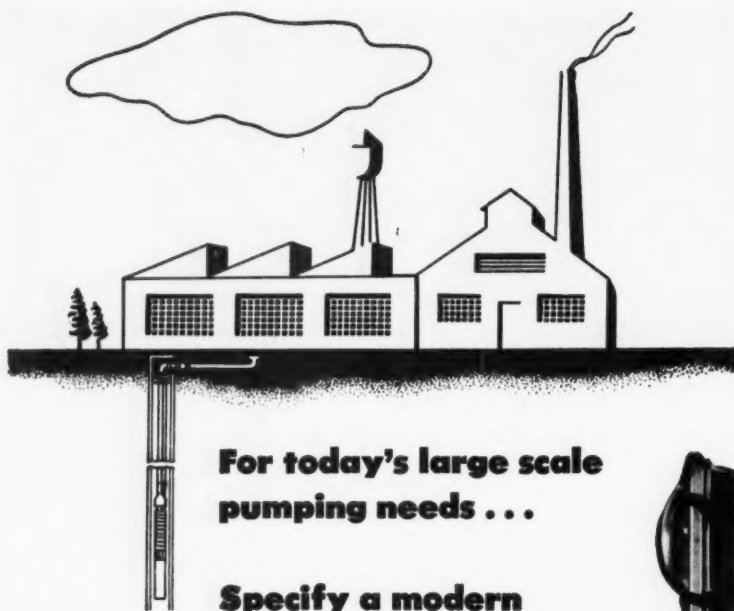
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(struc.) \$225,000. Client, Rich & Tucker Associates, architects.

¶ Alterations to existing three-story manufacturing building for new equipment. Hart Top Mfg. Co., Holyoke, Mass. (struc.) \$75,000. Client, D. O'Connell's Sons, Inc., general contractor.

¶ Additions and alterations, Denholm & McKay Department Store, Worcester, Mass. (struc.) \$300,000. Client, H. E. Davidson & Son, architect.

¶ Additions and alterations, Parke-Snow Department Store, Waltham, Mass. (struc.) \$250,000. Client, H. E. Davidson & Son, architect.

Loomis & Loomis

Windsor, Connecticut

¶ Science Unit #4, University of Massachusetts, Amherst, Mass. (struc.) \$2.5 million. Client, Morris Maloney, arch.

¶ Mountain View elementary school, East Longmeadow, Mass. (struc.) \$600,000. Client, Warren Ashley, architect.

MICHIGAN

Michigan Associates

Lansing, Michigan

¶ Engineering study of construction of navigational channel approximately 6 ft deep and 40 ft wide in the Strawberry Islands, Anchor Bay, Lake St. Clair, Michigan. (civil) Client, Michigan Waterways Commission.

¶ Research and development in composting. Client, Kitson Poultry Equipment Corporation.

¶ Portage Township sewerage system and sewage treatment plant. Client, Portage Township, Michigan.

¶ Improvements for water and sewerage system. Client, City of Constantine, Mich.

¶ Sewage plant evaluation. Client, Inflico, Inc.

¶ Municipal waste study. Client, Greenville, Michigan.

¶ Surveys and report, Chicago water diversion problem. Client, State of Mich.

¶ Water supply study. Client, Mt. Pleasant, Michigan.

C. W. Cassell and Associates

Ann Arbor, Michigan

¶ Study of paperboard mill losses, with recommendations for their correction including steam utilization and effluent losses, fiber losses, and improved stock preparation. Client, Consolidated Paper Co., Monroe, Michigan.

Bergstrom Engineering

Muskegon, Michigan

¶ Twenty-unit two-story masonry motel, North Muskegon, Michigan. \$80,000.

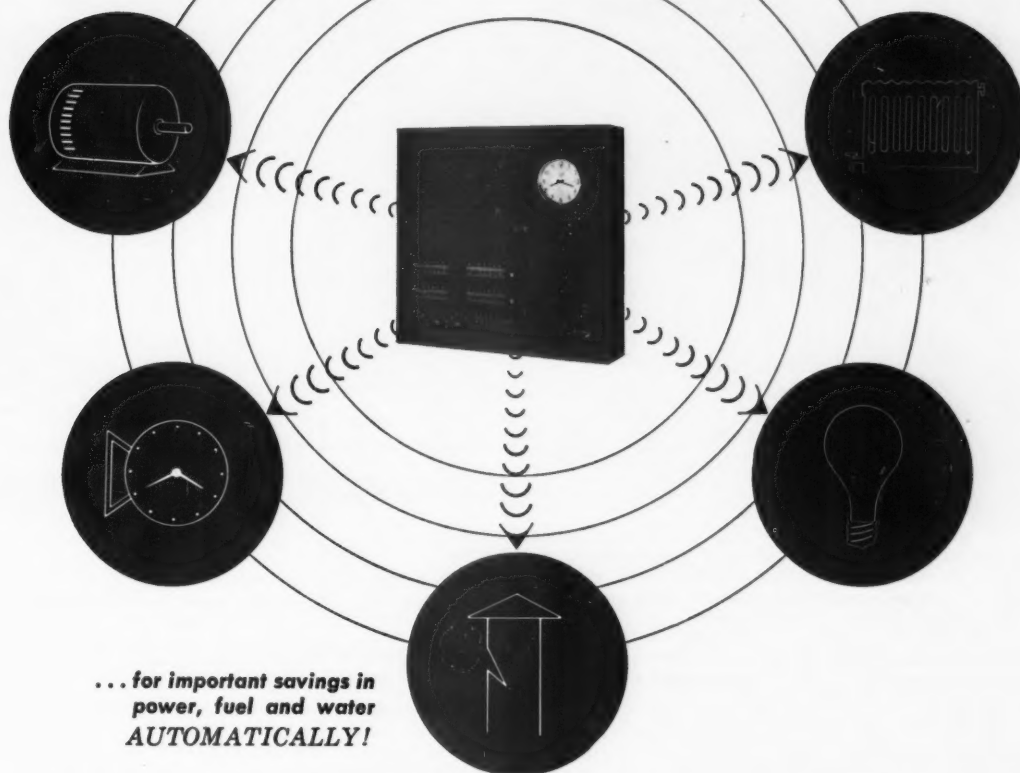
MINNESOTA

Campbell-Evans

Minneapolis, Minnesota

¶ Red Wing Shoe Co. Warehouse, Red Wing, Minnesota. Plumbing, heating, ventilating, well and pump, and sprinkler system employing a fire pump drawing from an underground reservoir with two 6000-gal. standby pressure tanks.

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SCOPE, the new Stromberg Central Operations Panel Electronic, contains a Stromberg master clock, automatic programming equipment and manual control panels. It *conserves* power, fuel and water—actually *lengthens the life* of operational equipment.

SCOPE times the "on" and "off" operation of remote utility functions and equipment *without* special or additional wiring. It initiates "command" signals through an electronic transmitter. Coded pulses sent over normal 60 cycle wiring energize coded receivers or relays which supervise the utility functions being controlled. Manual

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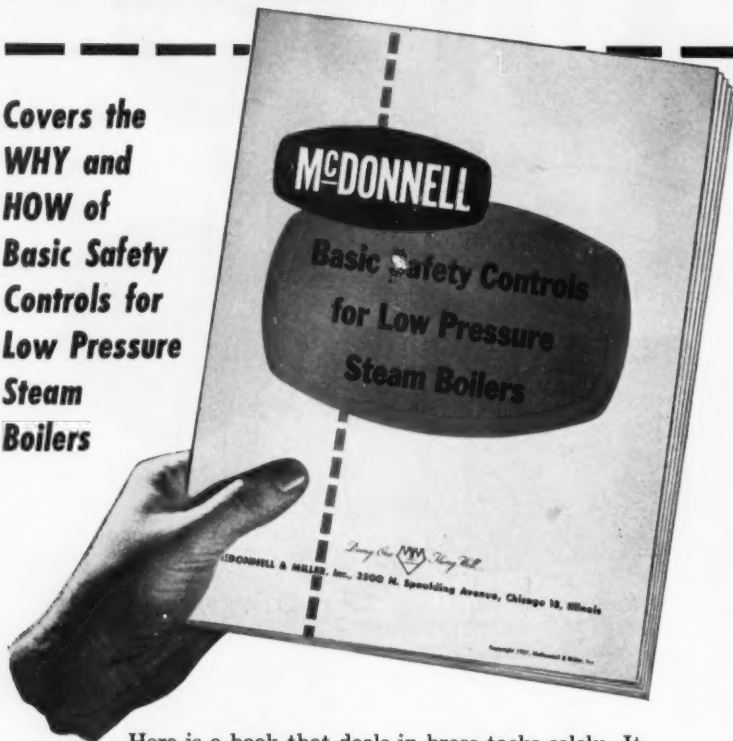
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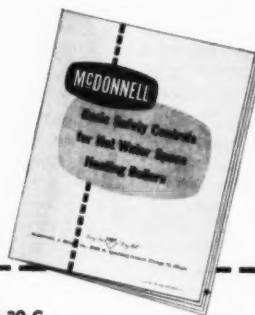
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(mech., elec.) \$274,000. Client, Irwin H. Kilstofte, architect.

MISSOURI

B. L. Oliver & Company
Kansas City, Missouri

¶ Ninety-acre twin-cell waste stabilization lagoon. \$138,400. Client, City of Raytown, Missouri.

¶ Approximately 3.6 miles of gravity fall sanitary sewer outfall lines. \$310,-883.62. Client, City of Raytown, Mo.

¶ Nine complete sewage lift stations and mains. \$643,000 (est.) Client, City of Raytown, Missouri.

¶ Approximately 62 miles of gravity fall sanitary sewer mains and laterals. \$2.2 million. Client, City of Raytown, Mo.

Leon Maslan & Company
Kansas City, Missouri

¶ Shopping center, Raytown, Missouri. (civil, struc., mech., elec., arch.) \$600,-000. Client, Gregory-Fifty Corporation.

Uri Seiden and Associates
Kansas City, Missouri

¶ Platte Valley school addition and remodeling, Buchanan County, Missouri, one-story, steel framing. (struc.) \$80,-000. Client, Frangkiser & Hutchens, arch.
¶ Two-classroom addition, Crocker, Missouri, one-story, steel framing. (struc.) \$25,000. Client, Frangkiser & Hutchens, architects.

¶ Educational unit for First Methodist Church, Warrensburg, Missouri, two-story, steel framing. (struc.) \$100,000. Client, V. Preston Terrell, architect.

MONTANA

H. E. Bovay, Jr., Consulting Engineers
Spokane, Washington

¶ Domestic water storage (60,000 gal.) and sewage lagoon and lift station, State Vocational School for Girls, Helena, Montana. \$85,000. Client, R. H. Hendron, Consulting Engineer and Sigvald L. Berg, Architect.

NEW JERSEY

Michael M. Burris
Englewood, New Jersey

¶ Public housing and aged housing (36 units), Guttenburg, New Jersey. (civil) \$250,000. Client, Ricker & Axt, arch.

¶ East Hill, Section VII (21 lots), Englewood Cliffs, New Jersey. (civil) \$800,-000. Client, Goodman & Guidera.

¶ Hudson County Mental Hospital sewage treatment plant, Secaucus, New Jersey. (struc., civil, mech., elec.) \$160,000. Client, Barnett Singer, architect.

¶ Watchung high school athletic fields, Warren Township, New Jersey. (civil) \$100,000. Client, E. T. Brown, architect.

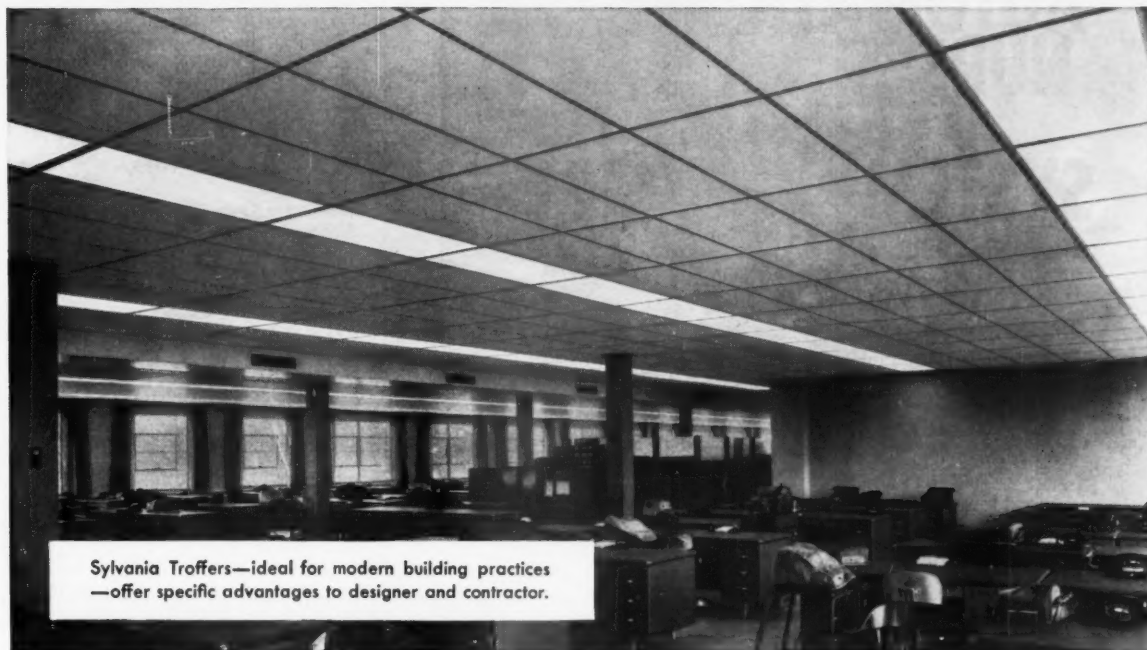
¶ Synagogue, Tenafly, New Jersey. (civil) \$1,650,000. Client, R. Geiger,

¶ High rise luxury apartments (90 unit), Hackensack, New Jersey. (struc., civil) \$2 million. Client, Goodman & Guidera.

¶ Regional high school athletic fields, landscaping, and utilities, Ocean Coun-

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...designed for the man who *works with lighting!*



Sylvania Troffers—ideal for modern building practices
—offer specific advantages to designer and contractor.

Sylvania's new line of Recessed Troffers has received exceptional acceptance from men who know and work with lighting . . . and for good reasons.

These Troffers give the smart trim appearance and good lighting qualities that guarantee user satisfaction. In addition, they have important *built-in features* which are not apparent to this user—but *which are vital to the designer and contractor responsible for the specification and installation of the lighting equipment.*

FOR THE DESIGNER—Shallow Sylvania Troffers combine smooth, uncluttered finished appearance with practically limitless application possibilities.

The use of hidden latches and hinges and the extensive choice of shielding media bring the designer's ideas to attractive reality in the finished installation.

3 types of fixture housing—with exposed, concealed or fit-in flanges—permit Sylvania Troffers to fit ALL popular ceilings.

And Sylvania Troffers achieve any desired lighting layout because of the wide choice of standard elements including 1' and 2' wide models, downlighting Accent Units and 4' x 4' units.

FOR THE ELECTRICAL CONTRACTOR

Sylvania Troffers supply labor saving, time saving advantages so necessary for profitable operation. For instance—Sylvania's exclusive Snap-Up Hanger eliminates the need of hanger straps for many ceiling types and reduces installation time appreciably . . . and the adjusting screw of this Snap-Up Hanger levels the Troffer simply and quickly through the use of a screwdriver from below.

Wasted time and motion on the job are eliminated through Sylvania's use of maximum factory pre-assembly and unit packing. Fixtures are normally shipped in individual cartons with end caps and accessories in place and with shield frame and shielding installed.

The next time you specify or install recessed lighting, check the many advantages of Sylvania Troffers before making your choice. Compare Sylvania Troffers feature for feature with other makes. Then you be the judge.

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Nylon pull cord stations provide these advantages:

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Optional system features:

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Your step-by-step guide to Nurses Call Systems design, available on request, is Couch Bulletin 137.

S. H.



Company, Inc.

3 Arlington Street North Quincy, Mass.

ty, New Jersey. (civil) \$110,000. Client, E. T. Brown, architect.
 ¶ Lake Waywayanda Development Study, Sussex-Passaic Counties, New Jersey. (regional planning) Client, Ferber and Associates.

Wol-Mur Engineering Industries Kenilworth, New Jersey

¶ Develop portable sound attenuation equipment for use in conjunction with jet aircraft while on ground. (struc., civil, mech.) Client, Harris Welding & Fabricating Co., Woodbridge, N. J.

NEW YORK

Michael M. Burris

Englewood, New Jersey
 ¶ Robin Hill, Sections III and IV (38 lots), located at Blauvelt, New York. (civil) \$1.2 million. Client, Garitt Custom Homes of Rockland.
 ¶ Shopping center, West Haverstraw, New York. (civil) \$1 million. Client, Shapiro and Associates.
 ¶ Shopping center, phase 1, Orangeburgh, New York. (civil) \$1 million. Client, Shapiro and Associates.

Sylvan L. Hanauer

New York, New York
 ¶ Carpet mill and warehouse, 20,000 sq ft, concrete and steel construction. (plumbing, heating, electrical, materials handling) \$100,000. Client, Duraloom Carpet Mills.

Daniel Koffler & Associates

New Castle, Delaware
 ¶ Complete alteration of business office, Brooklyn, N.Y. (mech., elec.) Client, Laub & Laub Accountants & Auditors.

Seymour Ribyat, P.E.

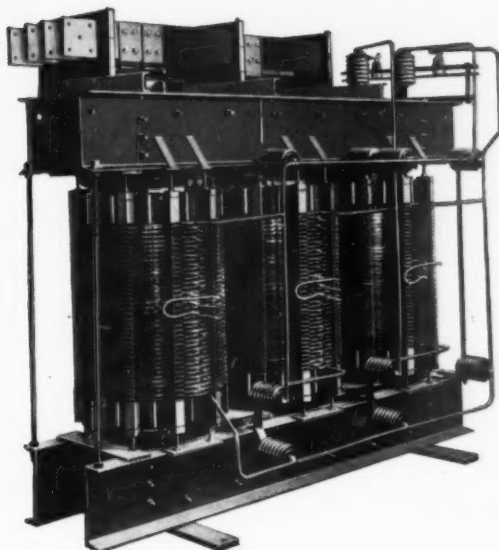
Syracuse, New York
 ¶ Reinforced concrete spillway structure spanned by 20-ft vehicular bridge, Oswego County, New York. \$30,000. Client, Lorton Wellnitz.

NORTH DAKOTA

K. B. MacKichan & Associates

Grand Forks, North Dakota
 ¶ Sewage collection system with stabilization lagoon, Carpio, N.D. (civil) \$50,000. Client, Village of Carpio.
 ¶ Sewage collection system with stabilization lagoon, Rock Lake, N.D. (civil) \$73,000. Client, Village of Rock Lake.
 ¶ Sewage stabilization lagoon and force main, Langdon, N.D. (civil) \$50,000. Client, City of Langdon.
 ¶ 300,000-gal. system for water storage, Park River, N.D. (civil) \$45,000. Client, City of Park River.
 ¶ Seal coat of bituminous pavement for streets at Langdon, N.D. (civil) \$17,000. Client, City of Langdon.
 ¶ Water distribution system and pressure tank, Deering, N.D. (civil) \$25,000. Client, Village of Deering.
 ¶ Sewage collection system with stabilization lagoon; water system extensions with a 50,000-gal. overhead tank. Litch-

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2000 Kva 3-phase 15 KV transformer, core and coils only. Illustrating disc type continuous windings without splices and substantial supports of all terminations.

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Photo courtesy of Western Electric Co.
Architects & Engineers: Lockwood Greene

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In less than 10 minutes, this man will have finished replacing a burn-out and cleaning a luminaire. It's a fast, efficient, no sweat job. He is free from climbing hazards, and the lowered fixture is dead. In addition, his only "auxiliary" equipment is a detachable handline!

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THE THOMPSON ELECTRIC CO.

P. O. BOX 873- B

CLEVELAND 22, OHIO

ville, N.D. (civil) \$130,000. Client, Village of Litchville.

¶ Well and supply line, Parshall, N.D. (civil) \$20,000. Client, City of Parshall.

¶ Sewage collection system with stabilization lagoon, St. Thomas, N.D. (civil) \$130,000. Client, City of St. Thomas.

OHIO

George M. Neuffer

Dayton, Ohio

¶ Vehicle service and storage building, Dayton, Ohio. (struc.) \$50,000. Client, Fabricated Steel Co.

PENNSYLVANIA

Daniel Koffler & Associates

New Castle, Delaware

¶ Airplane hangar, office, and reception building, Pottstown Airport, Limerick Township, Pa. (Struc., civil, mech., elec.) \$100,000. Client, Atlantic Aviation Corporation.

Gustav Stueber, P.E.

Pittsburgh, Pennsylvania

¶ Storage and equipment building for Carnegie Natural Gas Co., Pittsburgh, Pa. (struc.) \$100,000.

¶ Additions and alterations to Ellwood City Ledger building, Ellwood City, Pa. Single story addition, masonry walls, steel frame, steel deck. (struc.) \$40,000.

TENNESSEE

C. W. Cassell and Associates

Ann Arbor, Michigan

¶ Complete paper mill, located at Chattanooga, Tennessee. (civil, struc., mech., elec.) \$1.5 million. Client, Southern Chemical Cotton Co.

TEXAS

Arrowhead Engineers, Inc.

Denver, Colorado

¶ Montgomery Ward & Co. store building, Tyler, Texas. (struc., civil, mech., elec.) \$1 million. Client, Leon Brin, architect and Markets, Inc.

The Fluor Corporation, Ltd.

Los Angeles, California

¶ Engineering, procurement, and construction of distillate hydrotreater unit, Deer Park, Texas. \$2 million. Client, Shell Oil Company.

F. M. Hollandsworth

Willis Point, Texas

¶ New 3,4/OACSR, 12.5 kv rural feeder and conversion for system improvements per load growth. (elec.) \$50,000. Client, Kaufman County Electric Coop., Inc., Kaufman, Texas.

¶ 300 + miles aerial telephone system in Polk, Tyler, San Jacinto, Cherokee, and Walker Counties, Texas. (elec.) \$320,000. Client, Eastex Telephone Coop., Inc., Henderson, Texas.

¶ 160 miles aerial telephone system in Polk and San Jacinto Counties, Texas, proposing to serve approximately 450

NEW

An exclusive *TRANTER advancement
in heat transfer technology

MULTI-ZONE

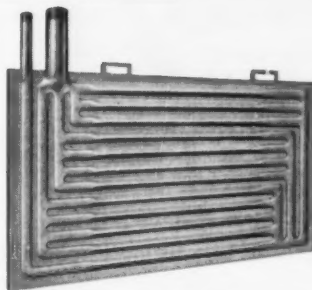
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DESIGN

*PATENTS APPLIED FOR

Years ahead performance plus all of the time-proven PLATECOIL advantages over pipe coils

The new MULTI-ZONE PLATECOIL features a multiple header configuration for improved steam distribution. The resulting increase in effective heat transfer area provides a built-in reserve capacity to deliver more heat during "start-up." It also speeds temporary recovery after introduction of work loads or processing ingredients for closer process control. Decreased condensate "trapping" produces FREE-FLO action.



OPERATING PRESSURES OF 250 psi now make it possible to apply the cost-cutting advantages of PLATECOIL to a new range of heat transfer problems. DURAWELD construction with TRANSTEEL mill-controlled mild steel provides a safety factor of 4 to 1 at 250 pounds steam.

Replace pipe coils with the new MULTI-ZONE PLATECOIL and save on tank space, fabricating, installation and maintenance costs. Factory-fabricated PLATECOIL is available in a wide variety of sizes and styles including single embossed, double-embossed, banked and rolled units in TRANSTEEL, Stainless, Carpenter 20, Monel, Hastelloy C and Nickel.

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Wayne near Pleasant St.



St. Joseph, Michigan

establishments by 1965. (elec.) \$220,000. Client, Eastex Telephone Coop., Inc., Henderson, Texas.

¶ 450 miles buried telephone system in Gonzales, Guadalupe, and Caldwell Counties, Texas, to serve approximately 1000 establishments. (elec.) \$600,000. Client, Guadalupe Valley Telephone Coop., Inc., New Braunfels, Texas.

¶ 233 miles buried telephone system in Cass County, Texas. (elec.) \$410,000. Client, Marietta Telephone Co., Marietta, Texas.

¶ All-buried plant rural telephone system with two central offices containing unattended automatic dial equipment, Windom, Texas. (elec.) \$285,000. Client, Win-Tel Telephone Co.

UTAH

Hodgson and Holbrook

Ogden, Utah

¶ Commercial Security Bank, Ogden, Utah. Two stories and basement with provisions for two additional stories, welded steel frame with concrete cellular steel deck. (struc., civil, elec.) \$2.1 million. Client, Commercial Bldg. Corp.

WASHINGTON

H. E. Bovay, Jr., Consulting Engineers

Spokane, Washington

¶ Atomic Energy Commission, Hanford Works. Project consists of all phases of engineering of a classified nature and will require a staff of 30 to 50 engineers for a period of two years.

¶ Design can stock facilities for Kaiser Aluminum & Chemical Corp. Trentwood Works. (struc., civil, mech., elec.) \$2.5 million.

¶ Modernize pumping facilities and design new pump house, Vera Irrigation District No. 15, Veradale, Wash. (struc., civil, mech., elec.) \$25,000 (est.).

¶ Design new domestic water system. (struc., civil, mech., elec.) \$100,000. Client, City of Airway Heights, Wash.

Bruce V. Christy & Associates

Seattle, Washington

¶ Pedestrian crossing, Seattle, Wash. (civil, struc.) \$26,000. Client, City of Seattle Department of Engineering.

Victor K. Schegolkov

Seattle, Washington

¶ Occupational therapy and recreation building, Fort Steilacoom, Washington. (struc.) \$500,000. Client, McGuire & Muri, architects.

¶ Junior high school, Longview, Washington. (struc.) \$1 million. Client, McGuire & Muri, architects.

FOREIGN

Crosier, Krauss & Greenberg

St. Boniface, Manitoba, Canada

¶ Silver Towers apartment building, 10-story reinforced concrete lift slab construction. Total area, 100,000 square feet. (struc.) \$1 million. Client, Canadian Lift Slab Corporation. ▲▲

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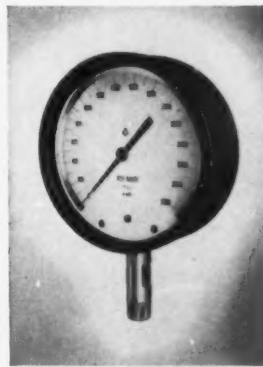
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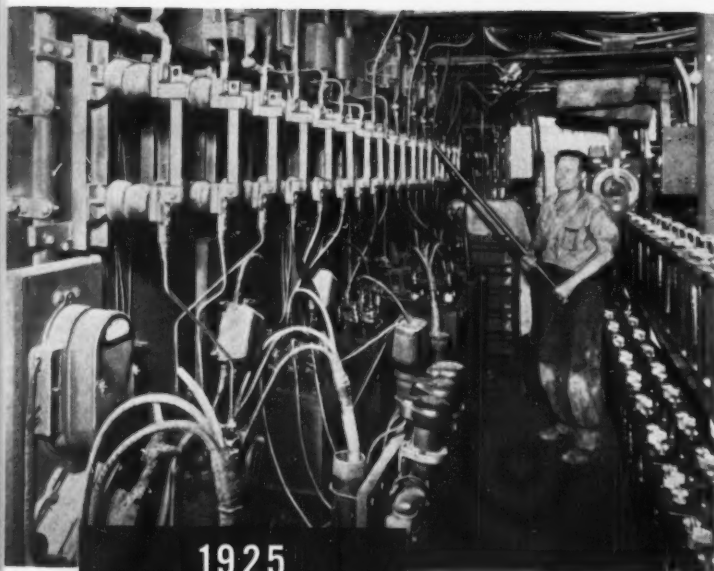


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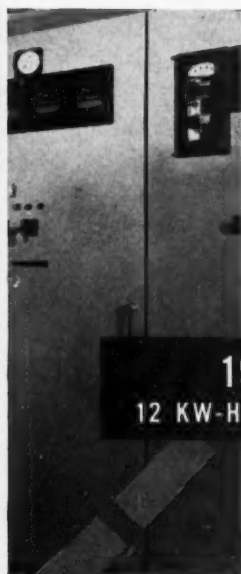
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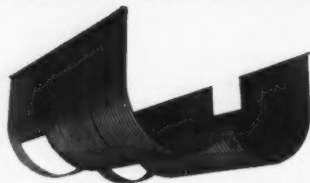
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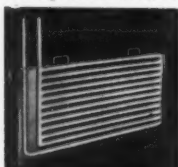
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Consulting Engineers' Calendar

Nov. 2-5. 11th Exposition of the Air-Conditioning and Refrigeration Industry; Convention Hall, Atlantic City, New Jersey.

Nov. 3-5. American Concrete Institute; Regional Meeting, Continental Hilton and Del Prado Hotels, Mexico City.

Nov. 4. American Institute of Consulting Engineers; Luncheon Meeting, Engineers Club, New York, N. Y.

Nov. 4-6. American Nuclear Society; Winter Meeting, Sheraton Park Hotel, Washington, D. C.

Nov. 4-7. Consulting Engineers Council; Board of Directors Meeting, Cincinnati, Ohio.

Nov. 12-13. Second Annual Texas Conference on the Utilization of Atomic Energy; Texas A. & M. College.

Nov. 16-19. American Institute of Electrical Engineers; Fifth Conference on Magnetism and Magnetic Materials, Sheraton-Cadillac Hotel, Detroit, Michigan.

Nov. 16-20. American Society of Mechanical Engineers; Automation Show & Conference on Materials Handling, New York Trade Show Building, New York, N. Y.

Nov. 16-20. National Association of Corrosion Engineers; Annual Florida Conference & Corrosion Short Course, Key Biscayne Hotel, Miami, Florida.

Nov. 17-19. Building Research Institute; Fall Conference, Shoreham Hotel, Washington, D. C.

Nov. 23. Cleveland Engineering Society; 8th Annual Construction Con-

ference, Engineering and Scientific Center, Cleveland, Ohio.

Nov. 29-Dec. 4. American Society of Mechanical Engineers; Annual Meeting, Chalfonte Haddon Hall, Atlantic City, New Jersey.

Nov. 30-Dec. 4. 27th Exposition of Chemical Industries, New York Coliseum, New York, N. Y.

Dec. 2. American Institute of Consulting Engineers; Luncheon Meeting, Engineers Club, New York, N. Y.

Dec. 6-9. American Institute of Chemical Engineers; Sheraton Palace Hotel, San Francisco, California.

Jan. 6. American Institute of Consulting Engineers; Luncheon Meeting, Engineers Club, New York, N. Y.

Jan. 31-Feb. 5. American Institute of Electrical Engineers; Winter General Meeting, New York, N. Y.

Feb. 1-4. American Society of Heating Refrigerating and Air-Conditioning Engineers; 2nd Southwest Heating & Air-Conditioning Exposition (Memorial Auditorium) and Semi-annual Meeting (Baker and Adolphus Hotels), Dallas, Texas.

Feb. 3. American Institute of Consulting Engineers; Luncheon Meeting, Engineers Club, New York, N. Y.

Feb. 9. Association of Consulting Chemists & Chemical Engineers, Inc.; Luncheon Meeting, Hotel Shelburne, New York, N. Y.

Feb. 18-20. National Society of Professional Engineers; Winter Meeting, Broadview Hotel, Wichita, Kans.

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ADVERTISERS' INDEX

ACF Industries, Incorporated	
—W-K-M Division	98, 99
Advance Transformer Co.	2nd Cover
Aerofin Corp.	24
Agat Mfg. Co.	184
Allan-Bradley Co.	91
Allis-Chalmers	163, 164-165, 167
American Gas Association	42-43
American Marsh Pumps	16
American Standard, Industrial Division	65
AMP, Inc.	102
Anaconda Wire & Cable Co.	246-247
Armco Drainage & Metal Products, Inc.	23
Armstrong Machine Works	69
Arrow-Hart & Hegeman	
Electric Co.	81, 82
Art Metal	182
Asphalt Institute, The	146-147
Auth Electric Co.	248
Automatic Switch Co.	133
Beatty Scaffold, Inc.	159
Bell & Gossett Co.	93
Benjamin Electric Mfg. Co.	4
Bettcher Mfg. Corp. Panelbloc Div.	202
B-I-F Industries, Inc.	30-31
Bituminous Coal Institute	26-27
Borden Metal Products Co.	45
Bruner Corp., The	101
Buell Engineering Co., Inc.	226
Buensod-Stacey, Inc.	125
Buffalo Forge Co.	41
Burnham Corp.	169
Bussmann Mfg. Div.	
McGraw-Edison Co.	206-207
Byrne Doors, Inc.	179

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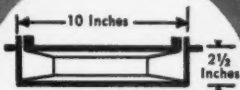
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Carrier Corp.	8
Chrysler Corp., Airtemp Div.	83
Clarage Fan Co.	15
Colorado Department of Development	266
COLT Ventilation of America, Inc.	160
Combustion Engineering Inc.	89
Conco Engineering Works	212
Condenser Service & Engineering Co., Inc.	210
Cook Co., Loren	22
Cook Machinery Co., Inc.	200
Couch Co., S. H.	258
Curtis Mfg. Co., Refrigeration Div.	139
Cyclotherm Div., National-U.S. Radiator Corp.	28-29
Darling Valve & Manufacturing Co.	267
Davis Instruments, Div. of Davis Emergency Equipment Co., Inc.	90
Day-Brite Lighting, Inc.	161
Dean Products Inc.	
Thermo-Panel Coil Div.	266
DeBothezat Fans, Div. American Machine & Metals, Inc.	87
Detroit Stoker Co.	79
DeZurik Corporation	145
Diamond Power Specialty Corp.	85
Dow Corning Corp.	33
Dracco, Div. Fuller Co.	19
DuKane Corporation	180
Dunham-Bush, Inc.	181
Edwards Co., Inc.	143
Edward Valves Inc., Subs of Rockwell Mfg. Co.	156-157
Emhart Mfg. Co., Maxim Div.	238
Executone	88
Federal Pacific Electric Co.	195
Feedrail Corporation	86
Flexitallic Gasket Co.	173
Foster Wheeler Corp.	47
Fuller Co., The	171
General Electric Co.	12-13, 37, 38, 39, 40, 53, 154-155, 251, 264-265
General Filter Co.	84
Globe Co., Products Div.	183
Goodrich Chemical Co. a Div. of The B. F. Goodrich Co.	193
Gorman-Rupp Co.	249
Goulds Pumps, Inc.	148
Guth Co., The Edwin F.	211
Hendrick Mfg. Co.	92
Hills-McCanna Co.	190-191
Hotel Pittsburgher	196
Inland Steel Products Co.	168
International Boiler Works Co.	36
I-T-E Circuit Breaker Co.	188-189
Jenn-Air Products Co., Inc.	197
Jerguson Gage & Valve Co.	94
Johns-Manville Corp.	10-11
Johnson Service Co.	18
Kaiser Aluminum & Chemical Corp.	58-59
Kaul Clay Co.	218
Kerite Co., The	199
Kerrigan Iron Works	170
Kohler Co.	216
Kraloy Plastic Pipe Co.	270
Lennox Industries, Inc.	153, 174-175
Liquidometer Corp.	250
McDonnell & Miller, Inc.	256
Mahon Co., The R. C.	208-209
Marlo Coil Co.	201
Master Builders Co.	56-57
Miller Co.	3rd Cover

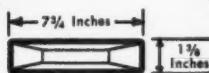
Minneapolis-Honeywell Regulator Co.	95, 96
Moloney Electric Co.	62-63
Mueller Co.	35
Murray Mfg. Co., D. J.	70
Nalco Chemical Co.	67
Naylor Pipe Co.	237
Nesbitt, Inc., John J.	4th Cover
NIBCO Inc.	9
Nicolet Industries, Inc.	21
Onan & Sons Inc., D. W.	230
Pass & Seymour, Inc.	234
Peerless Electric Co.	205
Peerless Pump Div., Food Machinery & Chem. Corp.	213
Penn Ventilator Co.	215
Petro	217
Pfaff & Kendall	228
Porter Co., Inc., H. K., National Electric Div.	269
Powell Co., The William	229
Powers Regulator Co.	75, 76, 77, 78
Pratt Co., Henry	34
Radio Corp. of America	185, 186
Rao Electrical Equipment Co., Inc.	253
Reliance Gauge Column Co.	214
Ric-wil Inc.	3
RLM Standards Institute, Inc.	203
Rockwell Standard Corp., Grating Div.	162
Roebing's Sons Corp., John A.	97
Rohm & Haas Co.	71
Rome Cable Corp.	48-49
Royal McBee Corp.	225
Sims Co.	20
Smoot-Holman Co.	233
Sorgel Electric Co.	259
Southwestern Plastic Pipe Co.	66
Spencer Turbine Co.	236
Square D Co.	119, 176-177
Standard Electric Time Co.	227
Stran-Steel Corp.	73
Stromberg-Carlson Co.	232
Stromberg Time Corp.	255
Strong, Carlisle & Hammond	231
Sumo Pumps, Inc.	254
Superior Combustion Industries, Inc.	55
Swartwout Co., The	235
Sylvania Lighting Products Div. of Sylvania Electric Products Inc.	257
Tapecoat Co., The	172
Temprite Products Corp.	68
Thermal Engineering Corp.	74
Thompson Electric Co.	260
Torit Mfg. Co.	242
Tranter Mfg. Co.	261
U.S. Electrical Motors, Inc.	25
U.S. Gauge, Div. of American Machine & Metals Inc.	263
U.S. Steel Corp. American Steel & Wire Constr.	50-51
High Strength-Alloy	60-61
Missiles & Rockets	244-245
Structural Steel Div.	6-7
Viking Pump Co.	240
Vogt Machine Co., Henry	123
Westinghouse Electric Corp. Agency & Construction	219, 220, 221, 222
Standard Control Div.	223, 239, 241, 243
Whiting Corp.	187
Wickes Boiler Co., The	17
Williams Equipment & Supply Co.	72
W-K-M, Div. of ACF Ind., Inc.	98, 99
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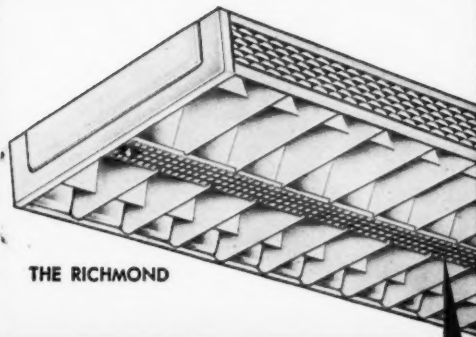
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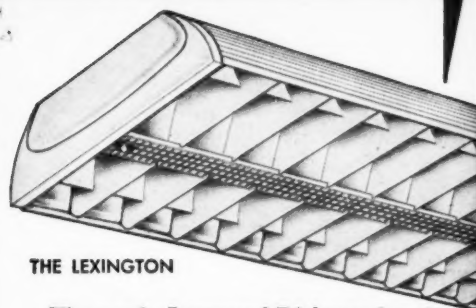
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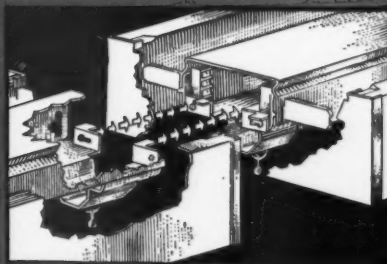
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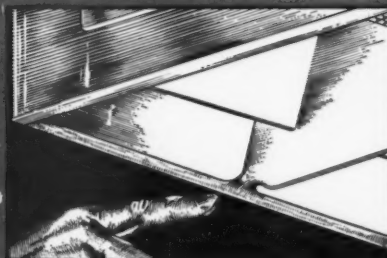
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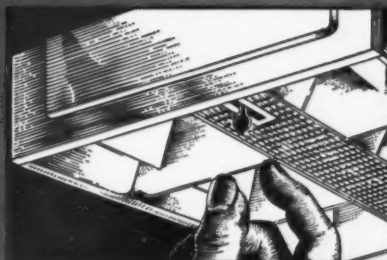
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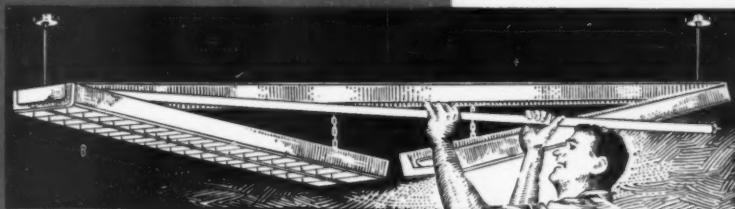
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V.13, No. 5

Part 2 November 1959

Consulting Engineer

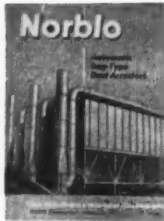
Keep This Directory in Your
Technical Reference File

A DIRECTORY OF ADVERTISERS' LITERATURE



Air Cleaning & Dust Collection	2	Mechanical Power Transmission	28
Air Cond., Heating, & Ventilating ..	3	Office Equipment & Services	29
Electrical Equipment	9	Piping, Valves, & Plumbing	30
Fire Protection	17	Power Equipment & Fuels	36
Heat Exchangers & Water Heaters ..	18	Process Equipment	41
Highways, Bridges, & Streets	19	Pumps & Compressors	42
Instruments & Controls	20	Refrigeration & Liquid Chillers	45
Insulation	22	Sound, Signal & Alarm Systems	46
Lighting	23	Structural Materials & Equipment ..	48
Materials Handling & Storage	25	Water Treatment & Waste Disposal ..	54

AIR CLEANING and DUST COLLECTION



1—Bag-Type Dust Collectors

How the *Norblo* automatic bag-type dust collector can provide continuous operation at full capacity is explained in four-page folder 164-5. Dimensions and capacities are listed in tabular form. A flow diagram explains how the unit works. Each part of the collector is shown separately with its description.

Northern Blower Co.



2—Dust Control Systems

Catalog SJP-1001 describes new *Chem-Jet* dust control systems for suppression of coal dust at rotary car dumpers, car shakeouts, track hoppers, conveyor transfer points, coal crushers, reclaim hoppers, and coal storage piles. Includes description of new Type A Hydro-Precipitator scrubber.

Johnson-March Corp.



3—Wet Dust Collector

Bulletin describes the new *Mist-O-Miser* wet dust collector. This unit is a new concept in wet collection and offers a wide range of construction features and methods of dust disposal. Cutaway photograph shows construction and line drawing shows principle of operation. Arrangements described and illustrated.

Fly Ash Arrestor Corp.



4—Charcoal Purification

Comprehensive bulletin describes activated charcoal purification cells and how they can save heating and cooling costs by permitting recirculation of air. Installation and construction details, air capacities, and resistances to air flow. Outlines charcoal reactivation services and testing procedures.

Barnebey-Cheney Co.



5—Dust and Mist Collectors

Bulletin 736 illustrates the entire *Aget* line and includes complete dimensions and specifications. Forty basic *Dustkop* units will collect everything from wood chips to fine dust particles. Also 4 *Mistkops*, 4 *Filterkops*, 2 *Dustbusters*. Descriptive copy and recommended uses for models. Photographs of installations.

Aget Manufacturing Co.



6—Cyclone Dust Separators

Bulletin sheets describe several models of cyclone dust separators, contain photographs of actual installations, multiple rating tables, specifications, floor space requirements, and dimensional drawings. Sheets are printed in two colors. Explain the use of after-filter where air is to be recirculated.

Torit Manufacturing Co.



7—Industrial Vacuum Cleaners

Bulletin 153D describes the *Spencer Vacuslot*. Illustrates the system and its components, and describes the operation. Dirt and litter is pushed to the *Vacuslot* and whisked away through the piping; mops are then cleaned at the *Vacuslot*. Illustrates water pick-up, boiler cleaning, and vacuum cleaning.

Spencer Turbine Co.



8—Carbon Air Purifiers

Bulletin 108A describes and illustrates *Dorex* activated carbon air purification equipment, C cells and H canisters. Data on equipment selection, installation, application is provided. Also given is information on unique *Dorex* replacement service. Discussions of activated carbon and conditions for proper purification.

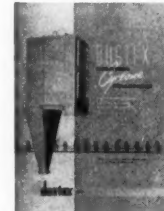
Connor Engineering Corp.



9—Industrial Dust Control

Bulletin 800 contains full technical information on industrial dust control and recovery equipment. Five types of dust filters are described in detail — four bag-type collectors, one cyclone type. Complete specifications for each model within each series are included. Photographs illustrate existing dust control systems.

Dracoco Division of Fuller Co.



10—Miniature Cyclone Dust Collectors

Cylindrical and rectangular collectors for recovery of particles down to 12 microns at 100% efficiency without use of filter media or tendency to plug. Collection applications include rotary, flash or spray dryers; high temperature recovery, and recovery of extremely fine abrasives.

Dustex Corp.



11—Cyclone Dust Collectors

Bulletin C-103 describes design and construction of *Buell* high-efficiency Cyclones. Features include exclusive "Shave-off" port which traps extra percentage of dust, particularly smaller fines. Fully illustrated. Lists all information necessary for specifying. Covers importance of manifolding.

Buell Engineering Co.



12—Centrifugal Dust Collectors

Improved design of the *Norblo* High Efficiency Low Static (H.E.L.S.) centrifugal dust collector includes deep body and improved proportions and does away with dampers frequently used to overcome back pressure, according to 4-page bulletin 104-3. Capacities and dimensions are listed.

Northern Blower Co.

AIR CLEANING and DUST COLLECTION continued



13—Air Purification

Bulletin T-264 describes types of equipment available for air purification by the "Black Magic" of activated charcoal. Details and specifications concerning portable purifiers, disposable filters, wall units, heavy duty cells, and cabinet purifiers. Charcoal increases comfort and safety in living and working spaces.

Barnebey-Cheney Co.



14—Dust Collectors

Catalog 359 describes briefly complete line of Torit dust collectors for industry. Current models of both self contained cabinet cloth filter type and cyclone separators are illustrated with dimensions and specifications for each. Installation photographs illustrate all models in use. Accessories are listed.

Torit Manufacturing Co.



15—Disposable Odor Filters

Bulletin 220 describes new activated carbon disposable odor filter unit, which combines high-efficiency odor removal with a high degree of air cleaning. Features resilient fiber construction with activated carbon particles surrounding a synthetic core. Bulletin includes engineering data.

American Air Filter Co., Inc.



16—Centrifugal Fans

Bulletin FD-11 describes Whirlax Airfoil centrifugal fans. Wide range of standard and optional features are offered. Various arrangements are explained and pictured showing the flexibility of application. All fan ratings based on standard test procedures. Available in Class I through Class IV construction.

Fly Ash Arrestor Corp.



17—Fly Ash Dust Control

Bulletin V-100 introduces the Verticone conditioner for fly ash dust control or for unloading of dusty materials from bins and silos. The Verticone also provides first practical means of dust-free unloading of cyclones, bag filters, and electrostatic precipitators. Units available up to 200 tons per hour capacity.

Johnson-March Corp.

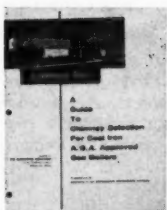


18—Dust Collectors

Dustkop model 30N50P, a one-unit system serving 7 grinders. Where floor space is limited, unit is suspended from ceiling or installed on roof. Pipe is angled from collector to caster-mounted dust drum placed in any unused area. Drum is rolled to outside dumping point and emptied without recirculating dust.

Aget Manufacturing Co.

AIR CONDITIONING, HEATING and VENTILATING



19—Cast Iron Gas Boilers

"A Guide to Chimney Selection for Cast Iron A.G.A. Approved Gas Boilers", bulletin EM-280, prepared to answer vent design problems with a minimum of calculation (new installations or existing chimneys). Contains calculation procedures, helpful venting hints, and sample problems as multiple boiler venting.

Weil-McLain Co.



20—Gas-Fired Boilers

Bulletin C-241, describes the Weil-McLain Type J cast iron gas-fired boiler, with a net capacity from 375 mbh to 3,105 mbh (14.9 hp to 119.5 hp.) Approved by A.G.A.; ratings approved by Institute of Boiler and Radiator Manufacturers. Construction, control, dual fuel features, ratings, and dimensions.

Weil-McLain Co.



21—Two-Pass Boilers

Bulletin B-3232 describes Trojan 2-pass unit for heat and power. Features include complete wet-back construction, safe updraft gas passages, ease of maintenance, large furnace volume, and high thermal efficiency. Design details and size range of all Titusville Trojan boilers are given in this 4-page bulletin.

Titusville Iron Works Co.



22—Air Conditioning, Refrigeration

Bulletin RS2D covers the entire line of air conditioning and refrigeration products. Range of sizes, specifications, and general description is given for each item. Items covered are packaged air conditioners (air and water cooled), packaged liquid chillers, room air conditioning coils, and others.

Curtis Manufacturing Co.

AIR CONDITIONING, HEATING and VENTILATING continued

**23—Surface Unit Heaters**

Catalog 956 describes *Grid* cast iron steam heat transfer surface unit heaters, blast heaters, and radiators. Describes and illustrates one-piece construction. Included are air distribution charts, heating capacities, conversion tables, and specifications. This four-section catalog with tab index is well illustrated.

D. J. Murray Manufacturing Co.

**24—Hot Water Boilers**

Bulletin HCC-2, a 20-page brochure, describes and illustrates the design, construction, advantages, and economies of the C-E LaMont controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process applications. Comparison table of heat content.

Combustion Engineering, Inc.

**25—Evaporative Condensers**

Catalog AC-1001 describes the new line of packaged CEN units for water cooled and evaporative condensers for commercial, institutional, and industrial applications. Consisting of three basic sections, conditioner section, compressor section, and condensing section, models are available ranging from 7½ through 60 hp.

National-U. S. Radiator Corp.

**26—Door Grilles**

Catalog F 8308-2 contains complete information on *Uni-Flo* visionproof *Site-Tite* and *Lite-Tite* door grilles. This bulletin illustrates door grille dimensions, lists grille sizing chart, and gives accurate up-to-date specifications for *Uni-Flo* door grilles. Typical applications and installations pictured.

Barber-Colman Co.

**27—Air Conditioning System**

New publication 11-2 features the "Nesbitt Year-Round Syncretizer," an air conditioner that sets a new standard of classroom comfort in schools and colleges. Colorful, 16-page catalog describes the operation of the cost-saving Nesbitt year-round heating, ventilating, and air conditioning system.

John J. Nesbitt, Inc.

**28—Packaged Boilers**

The Burnham scotch type packaged boiler incorporates a proven design with performance and capacity-tested boiler and burner for oil, gas, or combination gas and oil firing. Shipped as a complete unit, it is available in 8 sizes, certified ratings from 4740 to 12,750 sq ft EDR steam. Engineering details given.

Burnham Corp.

**29—Industrial Fans**

Bulletin 585 describes newly designed general industrial fans incorporating advanced aerodynamic techniques. The new fan combines improved efficiency with all the advantages of the flat radial blade design. Three wheel types are offered; diameters from 10 to 78 inches; capacities from 203 to 72,865 cfm.

New York Blower Co.

**30—Curtain Wall Air Conditioners**

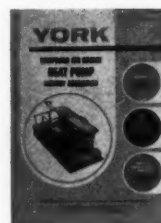
Bulletin PW-260 describes a new concept of curtain wall function, room-by-room air conditioning, an integral part of the Lupton curtain wall system. This is a true perimeter type system affording individual room control. It is a space saver and is easily installed. Includes capacities, dimensions, and specifications.

Michael Flynn Manufacturing Co.

**31—Tubeaxial Fans**

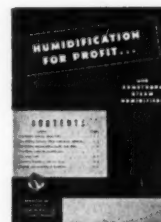
New high-speed belted and direct-connected tubeaxial fans, designed around an 8-blade "Macheta" airfoil axial flow propeller, are illustrated and described in bulletin 350. For top performance against medium pressures at speeds to 3450 rpm, units available in 16" and 18" diameters. Ratings and dimensions.

Aerovent Fan Co., Inc.

**32—Air Source Heat Pumps**

Bulletin EM59-2128 describes the York factory assembled compound air source heat pump. Wide capacity range, 50 to 150 tons cooling, up to 1200 mbh heating at 0 degrees F. Dimensions for compressor and outdoor air unit given. Complete description of the system as well as the components. Specifications included.

York Corp.

**33—Humidification**

"Humidification for Profit", 16-page bulletin 5001, gives data showing how relative humidity affects hygroscopic materials, health and comfort, and formation of static electricity. Schematic diagrams and sectional drawings demonstrate operation of electric and air-operated steam humidifiers.

Armstrong Machine Works.

**34—Space Heaters**

Catalog 2659 illustrates and fully describes how to effectively space heat in buildings with high ceilings. Sixteen pages include technical data, mounting heights, spread circle diameters, unit capacities of 30 sizes, specifications, and dimensional drawings. Complete charts, tables, and graphs included.

Young Radiator Co.

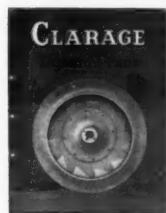
AIR CONDITIONING, HEATING and VENTILATING continued



35—Roof Exhausters

Bulletin 58-HA describes the new addition of the all-aluminum belt-driven Hi-D axial power roof exhauster. Available in 24 models in capacity ranges from 3330 cfm to 28,650 cfm and equipped with totally enclosed ball-bearing motors and full ball-bearing tubular drive assembly.

Jenn-Air Products Co., Inc.



36—Airfoil Blade Fans

Catalog 859 describes a new line of highly efficient, quiet airfoil blade fans. Dynafoil fans are particularly applicable to mechanical draft and heavy duty applications, such as industrial processes, conduit air conditioning, and tunnel ventilation. Various arrangements and panel openings pictured. Dimensions given.

Clarage Fan Co.



37—Cooling Towers

Folder 22L-15 introduces a new design concept in cooling towers offered in 9 sizes with capacities from 170 to 500 tons per cell. The all-steel structure contains an exclusive plastic fortified cellular fill, drive and water distribution system. Literature gives capacity ratings, selection example, and dimensions.

Carrier Corp.



38—Remote Room Air Conditioners

Bulletin 381A describes a complete line of remote room air conditioners. Information covers vertical and horizontal units, with and without cabinets. Four sizes are available, 200, 300, 400, and 600 cfm. Four types of conditioners are manufactured for use with both heating and cooling coils. Specifications.

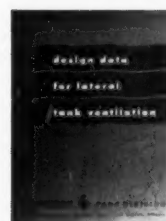
Acme Industries, Inc.



39—Packaged Liquid Chillers

New Kennard/Nelson packaged liquid chiller for air conditioning systems is described in bulletin PLC-101. Explains operation, application and construction of unit and its components—chiller, compressor, condenser, control system. Lists wiring diagrams, capacity tables, dimensions, specifications. Fully illustrated.

American Air Filter Co., Inc.



40—Tank Ventilating Systems

Bulletin DT-7-52 deals with design of lateral tank ventilation systems, using bifurcator fans. Includes fume removal information in problem-solution form, detailed tank diagrams, fan wheel material selection charts, and 10 graphs for calculating required CFW.

*DeBothezat Fans, Division of
American Machine & Metals, Inc.*



41—Counterflo Space Heaters

Bulletin 580-12 describes Dravo's industrial counterflo space heater. Designed for comfort heating, ventilating, process drying, wake-up air, and heat curing. Upright, inverted, and horizontal models diagramed. Included are dimensions, engineering data, and specifications. Cutaway shows construction.

Dravo Corp.



42—Boilers

Bulletin JR 10-4 describes Fitzgibbon's "R-Z-U" Junior, mechanical or hand fired boilers. Designed for large homes, schools, churches, greenhouses, and small commercial installations in ratings from 297,000 to 1,350,000 Btu/hr. Cutaway photographs show construction and line drawings the boiler dimensions.

Fitzgibbons Boiler Co., Inc.



43—Low Silhouette Ventilators

Twenty-page technical manual contains helpful information in planning ventilation for commercial, industrial, school, and institutional buildings. Lists a complete line of low-silhouette, all-aluminum ventilators in capacities to 38,350 cfm. Also includes a new prefabricated curb for roof ventilators, in 12 sizes.

Loren Cook Co.



44—Gravity Ventilators

This bulletin describes the two unique features of the Colt S.R. Series of low silhouette natural gravity ventilators: (1) Hinged top flaps open for normal extraction, full for optimum extraction in hot weather, seal heat in when fully closed. (2) New aero-foil curve design produces maximum positive extraction.

Colt Ventilation of America, Inc.



45—Gravity Roof Ventilators

Completely new 8-page Bulletin PAR-59 describes in detail the *Pul-Air* ridge continuous gravity roof ventilator. Contains intricate drawings on mounting variations, damper types and operation. Listed are standard sizes, weights, and accessories. Actual installation photographs are included.

Penn Ventilator Co., Inc.



46—Curtain Air Conditioners

An eight-page booklet of architect sketches showing different applications of the Lennox Comfort Curtain system for heating, ventilating, and air conditioning classrooms. An attractive two-color booklet, this brochure shows heater rooms and heating equipment integrated into the design of schools and libraries.

Lennox Industries Inc.

AIR CONDITIONING, HEATING and VENTILATING continued

**47—Gravity Roof Ventilators**

Bulletin CAM-3 describes Swartwout Airmovers, which act in a double capacity, that of high capacity gravity roof ventilators and skylights. Included are cutaway photographs showing construction, capacity tables, and installation instructions. One section shows how to calculate illuminating capacities. Swartwout Co.

**53—Centralized Controls**

Bulletin 76-4569 covers Honeywell's new modularized approach to centralized operation for air conditioning systems. Shows how engineers build up complete Supervisory Data-Center from basic units and how Selectographic approach provides visual supervision and direct control of sub-systems. Specifications. Minneapolis-Honeywell Regulator Co.

**48—Central Air Conditioning**

Engineering catalog with illustrative and descriptive information and complete selection data on central plant conditioners, multizone conditioners, sprayed coil units, heating-ventilating units, cooling and heating coils. This catalog is notebook type and is index tabbed for easy and quick use. Thermal Engineering Corp.

**54—Water Coils**

Bulletin R-50 describes and illustrates Aerofin type R removable-header water coils. These are cleanable-tube extended-surface coils for cooling air with water. Principal advantages are easy cleaning of tubes and positive drainage. Engineering data for various pass arrangements are given to assist in selection. Aerofin Corp.

**49—Exhaust Fan Ventilators**

Bulletin SPV-18 details Burt free exhaust fan ventilators, designed for extremely fast removal of contaminated air. Air-shaft dampers open automatically to vertically exhaust an unrestricted column of air, and close to thoroughly weather-proof unit when motor is shut down. Capacities are available to 75,550 cfm. Burt Manufacturing Co.

**55—Central Air Conditioners**

New bulletin AC-121 gives complete data on "Buffalo" Model G central station air conditioning cabinets. Type PC for horizontal floor or ceiling installation, type UPC for vertical operation, type PCW spray coil for horizontal operation, type VPCW spray coil for vertical operation. Details on performance data. Buffalo Forge Co.

**50—Central Air Conditioners**

Revised Bulletin 30 describes Marlo central station air conditioning units for heating, humidifying, cooling, dehumidifying, filtering, circulating. Ceiling or floor mounting types, horizontal or vertical air flow. Includes illustrations, construction features, performance data, charts, diagrams. Marlo Coil Co.

**56—Compact-Type Steel Boilers**

Catalog SB107 gives new SBI ratings and engineering details on the Burnham Compact-Type steel boiler. Designed to compress maximum heating capacity into minimum floor space. It is available for oil, gas, and coal firing. Capacities from 2,930 to 39,370 sq ft SBI net steam EDR. Burnham Corp., Steel Boiler Department.

**51—Centrifugal Blowers**

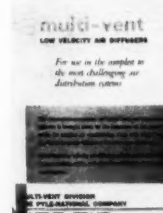
Catalog 236 describes Master Fan's self contained, compact, belt driven, and direct connected centrifugal blowers. Gives performance tables and dimensions of both forward curve and backward curve types. All are heavy duty, Class 1 construction and are available with a wide variety of optional features. Master Fan Corp.

**57—Power Roof Ventilators**

Bulletin 680-C describes Sky-Blast power roof ventilators. Weatherproof features include corrosion-proof, aluminum alloy propeller; nonclogging dampers and rain-shed; one-piece all welded base hot-dip galvanized after fabrication. Automatic fire-vent release. Sizes to 60 inches; air deliveries to 78,000 cfm. Robbins & Myers, Inc.

**52—Multi-Zone Air Conditioning**

First complete reference data on design and layout for multi-zone installation practice. Text, 24 pages, covers construction details, design procedures, basic air distributing schemes, air handling apparatus, budget costs, automatic control, winter and intermediate operation, specifications. Valuable for the designer. Buensod-Stacey, Inc.

**58—Air Diffusing Panels**

Bulletin 649 describes Multi-Vent low velocity air diffusing panels available in models, sizes, and styles to suit all types of ceiling construction. Five basic types are illustrated. Data given on each type includes nominal sizes, cfm capacity, ranges, special features, characteristics, advantages, and applications. Pyle-National Co.

AIR CONDITIONING, HEATING and VENTILATING continued

59—Radiant Panel Heating

"Radiant Panel Heating with Steel Pipe," 48 pages, covers the history of this type of heating, basic design, floor, ceiling, and wall panels, information on snow melting systems, pipe coil integration, design of a floor coil system, and a boiler hook-up diagram.

Committee on Steel Pipe Research,
American Iron and Steel Institute.



60—Air Conditioning Data File

A new high velocity data file is designed to help the air conditioning industry utilize the advantages of high velocity air transmission and distribution. It discusses what high velocity is, what it can do, and where it should be used, duct design, duct construction, and temperature control.

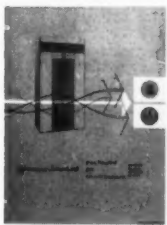
Barber-Colman Co.



61—Packaged Air Conditioners

Bulletin 8525 describes American-Standard's packaged air conditioners in sizes and types for every air conditioning need. Photograph with keyed captions show various components. Complete specifications for each model, both air cooled and water cooled. Drawings show layouts for single rooms and entire buildings.

American-Standard, Industrial Division.



62—Turbulator Units

Air-conditioning consultants and building managers will be interested in the new line of turbulators for zone control of air conditioned buildings. Anemostat turbulators are high-capacity 800 to 7000 cfm units with special air valves and mixing vanes built as a package, for installation in a high-velocity system.

Anemostat Corporation of America.



63—Gas Powered Air Conditioning

"Gas Powered Air Conditioning" describes refrigeration and dehumidification cycles for commercial, industrial, and residential buildings. Includes data on characteristics, application, and economic considerations. For the guidance of the consulting engineer, specifications for the various systems are given.

American Gas Association.



64—Belt-Driven Fans

Bulletin 450 describes belt-driven vane-axial fans, for maximum efficiency against high static pressures. Units overcome swirl or turbulence in duct systems with propellers and guide vanes that counteract torque and pass air through in a straight stream. Sizes 12- to 60-in., capacities to 47,000 cfm.

Aerovent Fan Co., Inc.



65—Air Conditioner-Dehumidifier

Bulletin 140 describes means of precise manipulation of humidity and temperature, air-conditioning critical processes or drying, and holding heat-sensitive materials, using absorbent liquid to dry air at moderate temperature without refrigeration. Diagrams, photos, chart of dehumidification, units up to 20,500 cfm.

Niagara Blower Co.

66—Centrifugal Roof Ventilators

Bulletin SDA-220 deals with the Peerless belt and direct drive centrifugal roof ventilators which have recently been added to the Peerless roof ventilator line. Features, construction details, performance data, dimensions, and specifications are presented.

Peerless Electric Co.,
Fan and Blower Division.



67—High Velocity Air Valves

Described and illustrated is *Pneumafol*, a new high velocity air valve that uses no motors or linkage mechanism. Unique pneumatic actuation, positive operation by 15 psi system, adaptability to dual duct systems, and other features are described. Isometric drawings show pneumatic function. Dimensions, capacities.

Connor Engineering Corp.



68—Multi-Space Air Conditioners

Catalog EM-59-2114 describes revolutionary induction unit system of air conditioning for multi-story, multi-space buildings. System especially suited to curtain wall type construction or building with large glass area. Includes system features, cost comparison, and diagram of system piping.

York Corp.



69—Central Air Conditioners

Catalog 7558 gives performance, capacity, and dimensional data required to select proper size unit for given installations as well as selection example. Capacities range from 700 cfm to 28,000 cfm. Horizontal and vertical arrangements offered in 10 sizes — multizone units in 9 sizes, selection of 2 to 21 zones.

Young Radiator Co.



70—Hot Water System Boilers

"Package Boiler Economy for Modern Hot Water Systems," describes Cyclotherm's Cyclonic Combustion, a patented principle, now incorporated in a design to efficiently produce hot water. No other type boiler can match the package unit for economy of space and fuel.

Cyclotherm Division
National-U.S. Radiator Corp.



AIR CONDITIONING, HEATING and VENTILATING continued

**71—Space Heaters**

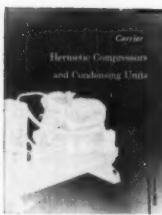
Twelve-page bulletin describes OG-4 new design space heater. Gas, oil, or combination dual fuel burners with push-button changeover. Output from 280,000 Btu/h on up. Rugged construction with completely enclosed burner adaptable for space heating, ventilation, make-up air, process heating, air conditioning.

Lennox Industries, Inc.

**72—Bifurcator Fans**

Catalog DB-37-55, 16 pages, describes operation of the bifurcator fan, a split-housing fan that exhausts hot, corrosive, and flammable fumes. Use of the bulletin makes fan selection easy since it gives full data on fan laws and static pressure, velocity pressure, and friction.

DeBothezat Fans, Division of American Machine & Metals, Inc.

**73—Hermetic Compressors**

New 24-page catalog 6GL-21 contains descriptive and engineering information on 5 to 150 ton hermetic compressors and condensing units for air conditioning and refrigeration applications. Complete capacity ratings, specifications, dimensions, and selection data are included to facilitate design and installation.

Carrier Corp.

**74—Unit Ventilator Controls**

New 8-page planning guide for consulting engineers covers the 3 important cycles for all leading types and models of unit ventilators. The booklet includes new face and by-pass units, and incorporates complete set of specifications and diagrammatic drawings for each. Tab permits easy reference in file.

Barber-Colman Co.

**75—Air-Cooled Condensers**

Bulletin F-4095 gives complete data on a new line of low silhouette units which eliminate problems common to other air-cooled condenser designs. Shipped as factory assembled packages. Vertical discharge gives accurate control regardless of wind. Unique by-pass damper head pressure control.

Buffalo Forge Co.

**76—Commercial Kitchen Ventilating**

Bulletin entitled "Commercial Kitchen Ventilation" gives factors determining the required capacity for fans in kitchen exhaust system. How gas or electric appliances affect the ventilation and air conditioning requirements of kitchen and dining areas. Includes table giving maximum heat gain from appliances.

American Gas Association.

**77—High-Velocity Air Conditioning**

Four-page bulletin 1312 covers the Hi-Static Multitherm unit, developed principally for high-velocity, conduit type air conditioning systems. Available in seven sizes, covering a volume range of about 2500 through 22,000 cfm, and suitable for systems with a static pressure of 8-in. wg maximum. Specifications.

Clarage Fan Co.

**78—High Velocity Ducts**

Special 24-page manual contains 11 pages of performance tables; explains step-by-step computations on two work sheets for 10-story office building; shows schematic layouts; information on duct construction and duct insulation. Also included are tables of static regain and transition loss and elbow losses.

Anemostat Corporation of America.

**79—Fans and Blowers**

Catalog 240 outlines commercial and industrial fans and blowers manufactured by the Peerless Electric Co. Exhaust fans, blowers and roof ventilators, centrifugal roof ventilators, and utility blowers are described. Dimensions and performance data included. All products are illustrated. Sales representatives listed.

Peerless Electric Co.

**80—Roof Exhaustors**

Bulletin 58-HC illustrates features of new Jenn-Air Hi-P centrifugal belt drive all-aluminum power roof exhaustors. Offered in 46 sizes with capacity ranges from 1085 cfm to 21,400 cfm featuring ball-bearing totally enclosed motors and full ball-bearing tubular drive assemblies. Bulletin is illustrated.

Jenn-Air Products Co., Inc.

**81—Air Conditioners**

Publication 302-1 features Nesbitt Series W heating, cooling, or dehumidifying water surface. Two surface types are described: Type WD with exclusive "pitched-in-casing" drainability feature; Type WB for booster service or where air quantities are small. Includes specifications and static resistance curves.

John J. Nesbitt, Inc.

**82—Radial Flat Blade Fans**

New bulletin 586 describes packaged industrial fans with radial flat blade wheels. Available in sizes 141 through 361. Economically designed, they feature one-man motor installation and removal. Motor and belt pull are on vertical centerline. They are easily rotatable or reversible in the field.

New York Blower Co.

AIR CONDITIONING, HEATING and VENTILATING continued



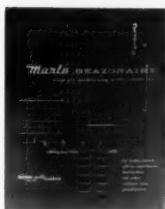
83—Roof Ventilators

Catalog FAI describes 59 new belt and direct drive fiberglass roof ventilators with 180 to 13,500 cfm capacities. Bonded fiberglass housings with molded-in sky-blue color are virtually indestructible and amazingly silent. New type air flow guides eliminate internal air shocks. Increases efficiency.
Swartwout Co.



85—Air Mixing Units

Catalog DD-4 describes dual-duct air mixing units and accessories for automatic control of high-velocity air conditioning systems; permits wide conditioning variations even for adjacent spaces. Automatic control feature maintains constant volume despite variations in static pressure. Units are pictured, diagrammed.
Buensod-Stacey, Inc.



84—Remote Air Conditioners

Bulletin 3355 describes Marlo Seazonaire remote room air conditioning units for multi-room installations, available in six standard types, floor or ceiling mounted, finished cabinet or recessed, capacities from 210 to 1260 cfm. Included are construction details, specifications, and installation dimensional drawings.
Marlo Coil Co.



86—Power Ventilators

Designed to serve with equal efficiency as exhaust or fresh air supply units, Burt low type power ventilators are detailed in bulletin SPV-16. Structural, design, dimension, and performance data are included for these high capacity, low profile ventilators. Available with either direct motor driven fan or belt drive.
Burt Manufacturing Co.

ELECTRICAL EQUIPMENT



87—Panel Instruments

Bulletin 3-15, 24 pages of descriptive information and illustrations, covers a full line of panel instruments from standard commercial use to military applications. Includes ac and dc meters, elapsed time meters, aircraft instruments and shunts, and current transformers. Dimension drawings.
Federal Pacific Electric Co.



90—Stationary Batteries

Bulletin 4676 describes how best to install and operate Exide antimony alloy stationary batteries. Applies to recent EWA and FWA lines as well as to Exide-Manchex and Exide-Tytex types. Includes instructions for charging methods and operating rules.
Exide Industrial Division
Electric Storage Battery Co.



88—Speed Controls

Bulletin F-1952, "Controlled Speed Systems," describes U. S. controls and systems using U. S. alternating current motors and operating from standard ac power lines, to control factors such as liquid level, pressure, rewind tension, load, position, multiple drives, grinders, lathes, and others.
U. S. Electrical Motors Inc.



91—Dry Type Transformers

Bulletin 46-950 contains complete statistical information on single and three-phase dry type transformers. For each type transformer there are dimension and layout drawings, limit capacities, such engineering application data as decibel readings, space and weight saving features, case temperatures.
Westinghouse Electric Corp.



89—Compact Unit Substations

Bulletin 5604-1A describes *Tranfo-Units* for indoor or outdoor, ratings 45 through 2500 kva, primary through 14.4 kv, secondary through 600 volts. These units, completely pre-engineered load centers for stepping down primary voltages, contain transformer and its primary and secondary distribution devices.
I-T-E Circuit Breaker Co.

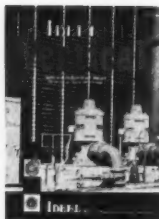


92—Magnetic Drives

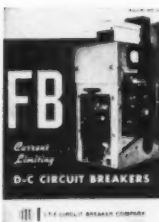
Catalog 243 details the line of magnetic drives from Electric Machinery Mfg. Co. The drive is offered in 5 models from 10 hp to 300 hp. Complete with controls, the drives provide quick, smooth, ac speed changing. Automatic speed control is another feature. Complete selection data and charts are provided.
Electric Machinery Mfg. Co.

ELECTRICAL EQUIPMENT *continued***93—Recording Instruments**

Catalog section 43-450 describes weather-proof recording instruments for load and voltage survey. Includes type 45 recorder application data, design features, specifications, circuit diagrams, engineering features, prices, and ordering information. Suitable for switchboard, portable, or pole-mounting. *Westinghouse Electric Corp.*

**94—Squirrel Cage Motors**

Bulletin 219 describes Ideal hollow and solid shaft squirrel cage induction, synchronous, and wound rotor motors in frames 584 and larger, 150 hp and up, for diversified requirements and conditions. Bearing and coupling sizing and selection data, sample specifications, and typical Ideal installations are included. *Ideal Electric & Manufacturing Co.*

**95—Circuit Breakers**

Bulletin 4601-1A contains descriptive and technical information on the I-T-E line of Type FB DC current limiting circuit breakers. Type FB circuit breaker features are listed and illustrated. Wiring diagrams, line drawings, weights, dimensions, charts, and application suggestions are contained in the bulletin. *I-T-E Circuit Breaker Co.*

**96—Switchgear**

Bulletin 3-440 gives feature-by-feature description of most modern design switchgear. Discussed are construction and operation of 5 and 15 air circuit breakers; indoor and outdoor housing construction, compartmentation, and simplified installation and maintenance. Ordering information, arrangements. *Federal Pacific Electric Co.*

**97—Crouse-Hinds' Facilities**

Twelve-page pictorial bulletin 2706 briefly describes manufacturing facilities and electrical products of Crouse-Hinds. Emphasis is on variety of equipment in the four product lines; *Condulet* electrical equipment, floodlights, aviation lighting equipment, and traffic control. Photographs show products in use. *Crouse-Hinds Co.*

**98—Unit Substations**

If you need system reliability, substation flexibility, engineering by builder, unified responsibility and billing, small space requirements, neater appearance, easy installation, simplified maintenance, ordering ease, you need Master Unit Substations. Bulletin GEA-3800D shows how to meet these requirements. *General Electric Co.*

**99—Bus Fuse-Fuseholder**

New Buss fuse-fuseholder combination for protection of individual fluorescent fixtures and other equipment on circuits of 300 volts or less. Bulletin SFH-8 tells how individual fusing reduces hazards of fires and explosions. Bulletin specifies the size fuse to use and where to locate it for the best protection. *Bussmann Mfg. Div., McGraw-Edison Co.*

**100—All-Purpose Control Cable**

Bulletin DM-5844 gives full technical data on Anaconda's thermoplastic all-purpose control cable with polyethylene insulation, double Densheath (PVC) jackets. Offers 7-wire stranding, excellent electrical characteristics, easy installation. Resists chemicals, mechanical abuse, moisture, heat deformation. *Anaconda Wire & Cable Co.*

**101—Electrical Controls**

Engineering reference catalog 18A contains a complete line of standard Zenith electric controls and timing devices. Photos, diagrams, engineering data, and prices on automatic transfer switches, magnetic contactors, remote control switches, program clocks, automatic reset timers, cycle timers, and special controls. *Zenith Electric Co.*

**102—Load Tap Changing Transformers**

Bulletin TU-146 describes Wagner load tap changing transformers designed to automatically regulate load voltage in % steps over a plus or minus 10% range. Featured are simplified transmission assembly, magnetic amplifier control, single shaft drive, and self-aligning switch contacts. Completely illustrated. *Wagner Electric Corp.*

**103—Power Centers**

Bulletin 47-350 contains descriptive information and operating data regarding the new Westinghouse self-contained dry or liquid type power centers. Illustrations and technical information on application and rating capacities. Dry type transformers are ventilated or sealed and liquid units are oil or inert-immersed. *Westinghouse Electric Corp.*

**104—Electrical Equipment**

New 20-page manual gives comprehensive specification data on Square D electrical equipment — safety switches, panelboards, switchboards, dimmerboards, control centers, bus duct, and substations. The manual also includes convenient reference guide to National Electric Code requirements. *Square D Co.*

ELECTRICAL EQUIPMENT continued



105—Switchboards

Bulletin 2015 is an illustrated review of fusible and circuit breaker switchboards through 2,000 amps. Descriptions of incoming line, distribution, and combination metering and distribution sections with fusible, circuit breaker, and motor control components. Tables, specifications, layout, and dimensions.

Federal Pacific Electric Co.



106—Conductor Plug-In Busway

Bulletin GEA-6172C gives description, application, selection, dimensions, ratings, weights, layout, and installation of GE's Type DH aluminum conductor plug-in busway and its accessories. Busway is available for 3-wire single-phase ac or for dc, 3-wire three-phase or 4-wire three-phase applications, 600 volts, ac or dc.

General Electric Co.



107—Ozone-Resisting Insulation

Bulletin RCD 700 is a descriptive-type folder covering two of Rome Cable's ozone-resisting insulations — oil-base (Rozone) and butyl-base (Rozone A). Descriptions of these insulations are included along with information and specs on Rome's flame-retardant polyethylene sheathing material, thermoplastic Roseal.

Rome Cable Corp.



108—Community TV Systems

Bulletin M-50-49 describes Blonder-Tongue Masterline equipment for multi-set operation in master and community TV systems. Consists of the main folder, an article on installing master TV systems in motels, catalog sheet of specifications, and price list. Bulletin is illustrated, includes amplifier specifications.

Blonder-Tongue Laboratories, Inc.



109—Receptacle Openings

These charts, diagramming the approved and standardized receptacle openings and plug blade arrangements of 28 different types of polarized, non-polarized, and grounding devices for 2-, 3- and 4-wire installations, are offered in 17 x 22 in. wall size and 8½ x 11 in. page size. Devices cover a complete range.

Arrow-Hart & Hegeman Electric Co.



110—Motors and Generators

Bulletin 43-205 contains product information on high speed and low speed synchronous motors and generators. Loose-leaf form, punched for three-ring binder. Gives information on low speed, high speed, and vertical-type construction, insulation, and exciters. All pages fully illustrated. Pictures of installations.

Electric Products Co.



111—Dimmerboard Systems

This 24-page bulletin explains basic components of stage dimmerboard systems, as well as optional components and features. Complete description of standardized dimmerboards, plus convenient selection chart. Specifications for all types of dimmerboard systems and layout dimensions are included.

Square D Co.



112—Motor Control

Here is an excellent engineering reference book on the "Theory and Practice" of motor control. Subjects discussed in 40-page handbook 14X7988 include function and operation, maintenance, components, types of enclosures, and types of control for each motor type. A useful trouble shooting chart also is provided.

Allis-Chalmers.



113—Gas-Filled Cable

Catalog J-947 gives complete technical information on Roebling's low pressure gas-filled cable. Included are physical and electrical characteristics, illustrated splicing and terminating instructions, current-carrying capacities, and accessories. Installation recommendations.

John A. Roebling's Sons Division

Colorado Fuel and Iron Corporation.



114—Control Centers

Control Centers in three construction types, NEMA Type "A", "B", and "C" are explained in bulletin B-6722. Information charts on short circuit protection, control center arrangements, selection of starter sizes and starter components, application and engineering data, dimension and circuit diagrams.

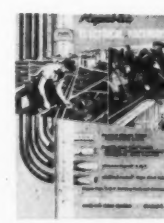
Westinghouse Electric Corp.



115—Switchboards

This 72-page bulletin gives complete layout and specification information on Square D 14-in. switchboards. Separate sections on circuit breakers and fusible equipment for service and distribution systems. Contains detailed layout and dimension drawings, wire and conduit tables, and lists NEC requirements.

Square D Co.



116—Electrical Raceways

Bulletin SA-EMT-59 contains data on the complete line of Republic electrical raceways. Exclusive features and various design data are shown. Products included are *Electrunite EMT* (Electrical Metallic Tubing), rigid threaded steel conduit, plastic coated EMT and rigid conduit, plastic pipe and other products.

Republic Steel Corp.

ELECTRICAL EQUIPMENT *continued***117—Circuit Breaker Accessories**

Bulletin GEA-6757 contains descriptive and catalog information for General Electric's full line of molded case circuit breaker accessories and modifications. The illustrated booklet features a quick reference accessory checklist for all G-E circuit breakers and also lists G-E magnetic trip only circuit breakers. *General Electric Co.*

**118—Dry-Type Transformers**

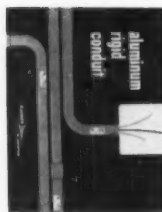
Bulletin 200 contains complete information about Hevi-Duty three-phase dry-type power and lighting transformers. Sizes range from 6 to 2000 kva. Illustrations, outline drawings, sound levels, capacities, prices, dimensions, weights, wiring diagrams, and temperature rise for each transformer are included. *Hevi-Duty Electric Co.*

**119—Single, Multi-Speed Starters**

Describes single and multi-speed starters, including combination and reversing starters, plus Square D *Spin Top* enclosures for hazardous locations. Also describes motor control racks for field mounting of *Spin Top* enclosures and other equipment. Bulletin includes price and dimension information. *Square D Co.*

**120—Terminating, Splicing Fittings**

"O.Z. Terminating and Splicing Fittings for Interlocked Armor Cable," 36-page engineering bulletin 135A, gives complete specifications, dimensions, cutaway drawings, photographs, and installation instructions. Prices and weights also are given for each item, along with ordering data and available materials. *O. Z. Electrical Mfg. Co.*

**121—Rigid Aluminum Conduit**

Bulletin EC-885 describes Kaiser's rigid aluminum conduit. It is light weight, corrosion resistant, nonmagnetic, non-sparking, and easy to install. Standard installation procedures, dimensions, weights, and packaging details are given. Industrial applications are listed. Illustrated with photographs and diagrams. *Kaiser Aluminum & Chemical Sales, Inc.*

**122—Molded Case Circuit Breakers**

Fundamentals of short-circuit protection for motor circuits in 8-page bulletin 5040-A. Features and applications of ETI molded case breakers are reviewed and pictured. Bulletin tabulates instantaneous trip range of ETI frame sizes and suggested trip setting positions for various horsepower motors. *I-T-E Circuit Breaker Co.*

**123—Electrical Fittings**

Bulletin 1022 listing box connectors, conduit fittings, entrance fittings, lock-nuts and bushings, connectors for MI cable, outlet boxes and covers, fittings for service entrance cable, pull boxes, switch boxes, sealite connectors, fittings for E. M. T. Prices, weight, dimensions, packaging, and features are detailed. *Appleton Electric Co.*

**124—"Rocker-Glo" Switches**

Illustrated four-page brochure describes new *Rocker-Glo* switch by Pass and Seymour. It has a luminous button and operates silently. Available in 15 or 20 amp, 120/277 volts ac. It has easy-to-wire pressure or screw terminals. Comes in Despard type with strap or Despard interchangeability. *Pass and Seymour, Inc.*

**125—Renewable Fuses**

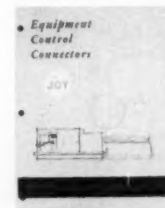
Bulletin 1320, a 12 page catalog, covers the complete line of Federal Pacific's economy renewable fuses. Cutaway drawings, photographs, cross-sectional diagrams, and time-current curves fully explain the construction and application features of both ferrule and knife blade fuses as well as economy renewal links. *Federal Pacific Electric Co.*

**126—Mobile Generating Plants**

Trailer mounted mobile generating plants, complete rolling power stations, are described in this plastic-bound handbook. For temporary tie-in, or semipermanent installation, diesel or dual fuel operation, these mobile plants may be practical. In four sizes: 350, 500, 1000, and 1250 kw. *White Diesel Engine Division, White Motor Co.*

**127—Copper Wires and Cables**

Catalog C-2-59 includes a complete set of ASTM standards applying to the manufacture of copper wires and cables. Includes data on dimensions, weights, breaking strengths, and resistances, as well as inductive and capacitive reactances, physical and electrical characteristics of solid and stranded wires. *General Cable Corp.*

**128—Equipment Control Connectors...**

Bulletin B72 describes Joy's equipment control connectors. Constructed of neoprene, the new connectors offer maximum safety and durability with minimum maintenance. Designed for applications up to 600 volts, they are available in oval, round, or dual round, 2 to 12 poles. Dimensions and specifications. *Joy Manufacturing Co.*

ELECTRICAL EQUIPMENT *continued*



129—Protective Fuses

Bulletin HCS tells how Buss *Hi-Cap* fuses have unlimited interrupting capacity on any voltage up to 600 to provide safe protection for loads above 600 and up to 5000 amperes. Describes operating characteristics and advantages, illustrates dimensions, contains charts on current limiting effect and opening times.

Bussmann Mfg. Div., McGraw-Edison Co.



130—Plastic Conduit

Descriptive two-color brochure covers four types of plastic conduit for electrical and communications lines (underground or underwater), single or multiple applications. Sizes 2 to 6 in. are featured, with use data, and illustrated assembly methods emphasizing installation cost reductions up to 35%.

Southwestern Plastic Pipe Co.



131—Interrupter Switches

Bulletin 1610B describes and illustrates arc chute type interrupter switches, fused and unfused, for switching feeder circuits. Usually metal enclosed, switch can be wall mounted or free standing, dimensions shown for both. Switches can close in on moderate faults. Diagrams show principal forms of switches.

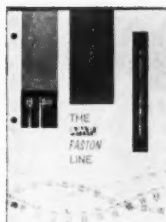
I-T-E Circuit Breaker Co.



132—Aluminum Plug-In Busway

Bulletin GEA-6173 completely describes the new General Electric Type DE aluminum plug-in *Flex-A-Power* busway. Describes unique one-belt joint, tubular aluminum conductors, and butyl insulated bus bars. Available in 3- or 4-wire systems for applications up to 600 volts, ac or dc. Specifications and installation data.

General Electric Co.



133—Terminals and Splices

Catalog 320 illustrates over 300 quick-connect terminals and splices for appliance, automotive, and other equipment wiring. The booklet contains test data, dimensions, and applications. Complete details of high speed pneumatic and electric wire terminators for mass production of leads and harnesses included.

AMP Inc.



134—Protective Relays

Catalog 5-020 describes Federal Pacific's complete line of protective relays. Featured are 15 models of protective relays, representing 8 different types. Tabular data, special features, design, settings, burdens at 60 cycles, contacts, and case given. Photographs and descriptive material detail its application.

Federal Pacific Electric Co.



135—Battery Chargers

Compact, vertically-mounted motor-generator battery chargers saving up to two thirds on floor space described in Bulletin 6259. By mounting the simplified-design, lightweight chargers overhead on pillars or walls, floor space requirements are eliminated.

Exide Industrial Division
Electric Storage Battery Co.



136—Bus Duct Layout

Booklet B-4272-D is designed for consultants' use in planning and selection of units for bus duct layout in commercial, institutional, and industrial buildings. Plug-in duct, outdoor feeder duct, low-impedance duct, and *Life-line Busway* are fully covered. Completely illustrated with engineering and test data.

Westinghouse Electric Corp.



137—Insulated Wire and Cable

Everything needed for the selection, design, installation, and operation of Kerite insulated wire and cable for light, power, and control service. Leatherette portfolio is tab-indexed to cover cable description, capacity, testing, technical tables, terminals, splices, and miscellaneous data of value to the consulting engineer.

Kerite Co.



138—Panelboard Circuit Breakers

Bulletin 3103 covers the Heinemann series 0911, an economical panelboard circuit breaker dimensionally interchangeable with other makes. Available in 1- and 2-pole models, 0.050 to 60 amperes, the 0911 uses hydraulic-magnetic actuation to end heat-induced nuisance tripping. Fast short-circuit interruption.

Heinemann Electric Co.



139—Dry Type Transformers

Bulletin 100A contains, in table form, complete statistical information on Hevi-Duty single phase, dry type, insulating transformers, .050 to 500 kva, for power and lighting circuits. Photographs, dimension drawings, capacities, prices, temperature rise, weights, and dimensions are given for each transformer listed.

Hevi-Duty Electric Co.



140—Diesel Generating Plants

Four-page folder F-142 describes the complete line of Onan diesel electric generating plants. Offered in a variety of models 3000 to 6000 watts, with *Vacu-Flo* cooling; 10,000 to 230,000 watts water-cooled. Diesel-driven marine electric plants for below-decks service also listed. All standard voltages.

D. W. Onan & Sons Inc.

ELECTRICAL EQUIPMENT *continued***141—Circuit Breakers**

Bulletin 4261-2B describes I-T-E's new *U-Re-Lites*, individually enclosed low voltage power circuit breakers. Information includes design, safety features, enclosure dimensions, selection chart, application data, and coil ratings. All features are illustrated photographically, as well as installation procedures.

I-T-E Circuit Breaker Co.

**142—Vertical Hollow-Shaft Motors**

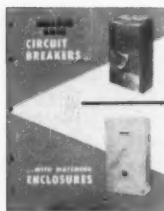
Bulletin 212 covers new line of Ideal vertical hollow-shaft motors from 15 to 125 hp in frames 284 to 505. Includes cutaway showing outstanding construction features, design of nonreversing, self-release and rigid couplings, and engineered lubrication and ventilation systems. Specifications and dimensions.

Ideal Electric & Manufacturing Co.

**143—Electrical Fittings**

Loose-leaf catalog 135 has been prepared to provide all the technical information you need to select the right conduit fittings, cable terminators, cast iron boxes, and solderless connectors for each of your electrical installations. It includes a comprehensive index and a section of useful engineering data.

O. Z. Electrical Mfg. Co.

**144—Molded Case Circuit Breakers**

Bulletin GEA-6754 provides descriptive and catalog information for General Electric's types TQL, TQ, TE, TF, TJ, TK and TKM molded case circuit breakers and matching enclosures. The 28-page illustrated booklet provides information on how to select the correct ampere rating of a circuit breaker.

General Electric Co.

**145—Silicone Insulated Motors**

Bulletin 1C-106, "Specify Silicone Insulated Motors and Transformers and Save" describes several ways to save on initial equipment, installation, and maintenance costs. Five ways in which major manufacturers are using silicone insulation systems in improved equipment designs are also reviewed.

Dow Corning Corp.

**146—Power Cables**

This 40-page bulletin gives a full description of Anaconda's complete line of rubber-insulated power cables. Constructions range from 600 to 15,000 volts and every type of dimensional data is furnished in this booklet. Also included are capacity and installation data, as well as instructions on how to order.

Anaconda Wire & Cable Co.

**147—Electrical Power Distribution**

Catalog SM-244, 16 pages, describes in detail the modern method for centralizing electrical power distribution and motor control equipment for industrial applications. It also contains suggested ideas for control specifications, and gives a simplified selector for use in control center layout and planning.

Square D Co.

**148—Relays**

Bulletin 5-050 offers information on Type CDG relays in 3 designs: inverse, very inverse, extremely inverse. Intended for use by utility and industrial companies in controlling the distribution of electricity. This 16 pp. bulletin includes illustrations, dimension drawings, wiring diagrams, and current curves.

Federal Pacific Electric Co.

**149—Dry-Type Transformers**

This bulletin 958A describes and illustrates Sorgel Electric Company's standard line of low sound level dry-type transformers in ratings of 1/4 to 3333 kva single phase and 1 to 10,000 kva three phase, 120 to 15,000 volts suitable for varied installations. Consultants will find the book valuable.

Sorgel Electric Co.

**150—Primary Unit Substations**

Economy, reliability, safety, and convenience are advantages offered by new I-T-E primary unit substations. Four-page bulletin, S-2701-1A details data on the I-T-E line in ratings from 6900 through 69,000 volts incoming and 2400 through 13,800 volts outgoing. Incoming, transformer, outgoing sections illustrated.

I-T-E Circuit Breaker Co.

**151—Motor Controls**

Motor Control Catalog 14 indexed for easy reference to manufacturer's complete line of motor controls and accessories, including complete size, weight, and ratings information, wiring diagrams, dimensional drawings, and prices. One section lists parts available; another contains heater tables and motor charts.

Arrow-Hart & Hegeman Electric Co.

**152—Continuous Power Systems**

Bulletin 21-200 describes the Inverter-Diverter, the continuous ac and dc power system. It supplies standby power instantaneously without losing even a fraction of a cycle. Includes features, construction, and operation. Oscillogram shows transfer from normal to emergency operation caused by 10% undervoltage.

Electric Products Co.

ELECTRICAL EQUIPMENT *continued*



153—Transformers

Bulletin SL-703 describes in detail the electrical and mechanical features of Moloney's exclusive double moving coil design constant current transformers. Types of street lighting transformers described include dry type, subway type, and oil filled conventional and protected units of both the standard and high power factor. *Moloney Electric Co.*



154—Cathodic Protected Cable

Recent figures show America's annual bill for corrosion is six billion dollars. Bulletin 1033 on Simplex cathodic protection cables offers information on the most effective means of combating this expensive problem. Simplex cathodic protection cables are available with a wide variety of insulating materials. *Simplex Wire & Cable Co.*



155—Electric Motors

Bulletin F-1878 is a brief presentation of the complete line of U.S. Motors, ranging from 1/4 to 500 hp. The major U.S. motor lines include (1) vertical pump, (2) variable speed, (3) dripproof, (4) enclosed and (5) internally geared. U.S. also makes many special types. Printed in full color, illustrated. *U. S. Electrical Motors Inc.*



156—Stabilizing Transformers

Bulletin GEA-5754D gives a quick, easy-to-use source of specifying and ordering information on the General Electric voltage stabilizing transformer. This illustrated bulletin tells why voltage varies, how voltage stabilizing transformers work, advantages, operating characteristics, and where they are used. *General Electric Co.*



157—Generating Plants

Four-page folder F-145 describes the complete line of Onan gasoline driven electric generating plants. Air-cooled units offered in sizes ranging from 500 to 10,000 watts. Water-cooled plants from 10,000 to 170,000 watts. All standard voltages. Complete line of accessories and controls available. *D. W. Onan & Sons Inc.*



158—Fusible Panelboards

Bulletin 3-230 describes QMQB fusible panelboards from 30 to 1200 amps, 250 to 600 volts. Were developed to meet the increased power of electrical distribution systems. Features are visible blade contacts, dionizing arc quenchers, and high pressure fuse holders. Panelboard selection data included. *Federal Pacific Electric Co.*



159—Universal Switchboards

Bulletin GEA-6627 completely describes the features of General Electric's new Type DR universal switchboard. Also includes detailed descriptions of all types of Type DR component devices plus layout and dimensional information. Switchboard is suitable for maximum 600-volt, ac, 250-volt, dc, service. *General Electric Co.*



160—Metalclad Switchgear

New brochure describes components, applications, and performance of metalclad switchgear, ratings to 500 MVA short circuit interrupting and 44,500 amp fault closing. Drawings show substation, switching center, and service entrance applications. Typical installations and construction shown. *S & C Electric Co.*



161—Power Switchgear

Bulletin 1616A describes construction, standard assemblies, and standard components for power switchgear with fused and unfused interrupter switches. Metal enclosed units are grouped with common bus, providing flexible arrangements. Operation of switches explained with accompanying operational illustrations. *I-T-E Circuit Breaker Co.*



162—Electric Plants

Catalog KEP56-1, 24 pages, shows the line of Kohler electric plants used as an independent source of electricity for sole supply and for automatic standby when central station power fails. Sizes range from 500 w to 100 kw, gasoline and diesel. Battery charging units in 6, 12, 36, and 140 v capacity are described. *Kohler Co.*



163—Assembled Switchgear

Bulletin 32-250 outlines indoor and outdoor assembled switchgear utilizing type DH De-ion drawout air circuit breakers. Contains switchgear engineering design features, outline dimension drawings, application data, and specifications. For commercial buildings, industrial plants, electric utilities and public works. *Westinghouse Electric Corp.*



164—Motor Controls

Catalog 242A describes a line of motor controls designed for 600 volts and up. Offered for either synchronous or induction motors, the "Safuse" line features complete operator safety. Bulletin includes features, maximum horsepower ratings, specifications, options, and dimensions. Photographs of components. *Electric Machinery Mfg. Co.*

ELECTRICAL EQUIPMENT *continued***165—Molded Case Breakers**

Compact pocket-size bulletin 5004-1A gives construction and performance features, ratings, and details on complete line of I-T-E molded case breakers by types, current ratings, overcurrent devices, accessories, and modifications available. Each model is illustrated in column over specifications.

I-T-E Circuit Breaker Co.

**166—Load Tap Changing Equipment**

Bulletin LTC-2907 describes the operating principle of Moloney's load tap changing equipment incorporating an exclusive reactor, by-pass, switching principle. Applications are shown in pictures with accompanying circuit diagrams. General construction and that of various mechanisms are explained and illustrated.

Moloney Electric Co.

**167—Transformer Buyer's Guide**

Bulletin 1047, Buyer's Guide to help in specifying and ordering dry-type transformers. A quick and easy-to-use single source of specifying and ordering information. Pictorial index gives basic descriptions, application information, and page numbers on which prices, dimensions, and other data are found.

General Electric Co.

**168—Power and Lighting Cable**

Bulletin EC-716 describes Kaiser aluminum power and lighting cable for use in schools, factories, shopping centers, office buildings, and many other applications. Included are advantages, types available, insulation properties, breaking strength, and dimensions. Includes voltage drop charts. Installations pictured.

Kaiser Aluminum & Chemical Sales, Inc.

**169—Building Type Switchboards**

Bulletin SA-8305 is designed to assist the consulting engineer in specifying building type switchboards. Includes layout data, dimensions, and specifications for Westinghouse switchboards designed for office, commercial buildings, hotels, residences, schools, hospitals, stores, and institutional buildings.

Westinghouse Electric Corp.

**170—Bus Duct**

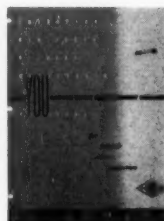
Bulletin 3-125, illustrated review of Federal Pacific's line of plug-in and low impedance bus duct. Contains detailed descriptions on straight sections, fittings, and protective devices. Included are construction details of plug-in duct (225-1000 ampere) and low impedance (600-5500 ampere). Fully illustrated.

Federal Pacific Electric Co.

**171—Feed-In Duct**

Bulletin SD-101 describes in detail Square D totally enclosed low-impedance aluminum feed-in duct. Also explains how telescopic joints eliminate need for special lengths and demonstrates the safety, space-saving, and mounting features of Square D feed-in duct. Includes suggested specifications.

Square D Co.

**172—Circuit Breakers**

"What You Should Know About Circuit Breakers for Branch Circuit Protection," 16-page manual 101, describes ways of protecting your client from fire, equipment damage, excessive wiring costs, and needless circuit interruptions. How hydraulic-magnetic circuit breakers provide this protection is pointed out.

Heinemann Electric Co.

**173—Armored Power Cables**

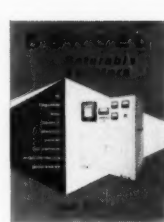
Bulletin RCP 730 describes Rome's interlocked armored power cables. They are easily installed, flexible (circuitwise), easily accessible, moisture resistant, carry more current, and reduce space requirements. Descriptions and illustrations of standard 3-conductor cables and data on cable termination and jointing.

Rome Cable Corp.

**174—Wiring Devices**

Catalog 60, 75 illustrated pages, describes complete range of electrical wiring devices. Both the interchangeable Despard line and the P&S conventional line. Everything from switches to fixtures to devices for every purpose are listed. A 15-page index and price list are also included in this catalog.

Pass & Seymour, Inc.

**175—Saturable Reactors**

Bulletin 658 illustrates and describes Sorgel saturable reactors to control, regulate, and vary electric power from 1 kva to 3000 kva, for various manufacturing processes, either manually or automatically. Also includes a questionnaire form to fill in to obtain complete information for any application.

Sorgel Electric Co.

**176—Electrical Conduit**

Bulletin KE 1058 lists physical, thermal, and electrical data for nonconducting Kraloy PVC (polyvinyl chloride) electrical conduit, with photographic installation details. Specifications for thin wall conduit (1/2 to 2 in.) and standard wall conduit (1/2 to 4 in.), all connections, couplings, and fittings are included.

Kraloy Plastic Pipe Co., Inc.

ELECTRICAL EQUIPMENT *continued*



177—Metallic Sheathed Cables

Bulletin 1031 contains questions and answers on Simplex's new sealed metallic sheathed cables. Simplex C-L-X is a continuous, lightweight, metallic cable sheath which is impervious to gases, chemicals, and water. Its construction, with a thermoplastic covering, gives a combination of unmatched properties. *Simplex Wire & Cable Co.*



178—Low Voltage Circuit Breakers

Bulletin 6004-C provides a complete review of I-T-E Circuit Breaker Company's new low-voltage power circuit breakers and switchboards. They range in unit ratings from 225 to 4000 amperes. Advanced features of the new K-Line breakers, rated at 225, 600 and 1600 amperes, are described. *I-T-E Circuit Breaker Co.*



179—Safety Switch Design

New advances in safety switch design are described in Bulletin CPD-74, a 32-page illustrated booklet, which describes General Electric's new line of 30-600 ampere light and heavy duty safety switches. Featuring visible blades and quick-make, quick-break contacts, the switches are space savers. *General Electric Co.*



180—Electrical Motors

New Westinghouse Life Line "A" motors set standards of motor performance for greater application flexibility. Stronger insulating materials, best electrical performance, improved accelerating torque, pre-lubricated bearings, dynamic balancing of moving parts, amortized frame and other features are explained. *Westinghouse Electric Corp.*

FIRE PROTECTION



181—Fire Extinguishing Systems

Catalog S-62 covers Fyr-Fyter's nine major brands of interior fire extinguishing systems, portable extinguishers, cabinets, and other inside fire control products. Considered one of the most comprehensive product information guides of its type ever published, it is particularly useful to consulting engineers. *Fyr-Fyter Co.*



182—Fire Pumps

Kit 08B8514 provides a wealth of information on fire pumps for motor, engine, or steam turbine drives. Package contains descriptions, catalog listings, performance curves, and engineering data on pumps to 2500 gpm, 3500-ft head. Also includes booklets on related equipment such as control, motors, and engines. *Allis-Chalmers.*



183—Standpipe Units

First major improvement in thirty years in standpipe fire protection units is completely illustrated and described in this four-page folder. Features hose storage rack on door for increased fire-fighting efficiency. Unit saves wall space. Lower installation costs, lower price, Underwriters' approved. *W. D. Allen Manufacturing Co.*



184—Fire Check Book

Fire Check Book is designed as a handy reference for use in the selection and installation of non-sprinkler fire protection equipment. It shows the basic requirements for standpipe system, hose station, extinguisher, and exterior centers. Check Book includes coupon specifications forms which simplify spec-writing. *W. D. Allen Manufacturing Co.*



185—Industrial Fire Control

Scientific paper dealing with disastrous spreading of industrial fires when no openings are provided for escape of super-heated air and smoke, and the solution: Colt dual purpose fire ventilators which drop open in case of fire and act as an efficient natural ventilating system in normal plant operation. *Colt Ventilation of America, Inc.*



186—Fire Alarm Systems

Catalog illustrates and describes Standard's March Time, Master Code, and Box Code systems. Also covered are supplemental pre-signal circuits, non-code continuous sounding bells and horns, code transmitters, control panels, stations, detectors, signals, and accessories. Specifications included. *Standard Electric Time Co.*

HEAT EXCHANGERS and WATER HEATERS



187—Lined Water Storage Tanks

Sims Co. of Erie, Pa. has prepared a condensed catalog describing copper lined, plastic lined, and cement lined tanks. Included are capacity data for sizes from 53 to 6570 gallons; dimensions, weights, pressures (75-100-125-150 lbs wp), and prices. Cost of linings listed separately.

Sims Co., Inc.



188—Heat Recovery Snubbers

Bulletin 272 describes Burgess-Manning's heat recovery snubbers. Available for vertical and horizontal mounting. They employ standard weight pipe coil as the water carrier and heat transfer surface. Construction provides high degree of silencing.

Burgess-Manning Co.
Industrial Silencer Div.



189—Heating Radiation Water

Complete information on heat exchangers for heating radiation water with steam is supplied in this 32-page catalog. Rating tables are supplied for 67 different units with 10, 20, 30 and 40 degree temperatures and steam pressures ranging from 2 to 25 pounds. Catalog SC-159 also includes material specifications.

Bell & Gossett Co.



190—Pressure Vessel Construction

Catalog FAB-10 presents an illustrated guide to pressure vessel construction as provided for under Section VIII of the ASME Code. Furnishes direct reference to the applicable rule in the Code. Typical products and installations shown. A publication by the Fitzgibbons Fabricating Division.

Fitzgibbons Boiler Co., Inc.



191—Heat Exchangers

Catalog HEC-1R covers carbon steel heat exchanger and condenser tubes. A typical specification, A.S.T.M. A-214, covering this grade of tubing has been broken down paragraph by paragraph to show how *Electrunite* tubing is processed to meet each requirement. Photographs show various production operations.

Republic Steel Corp.



192—Heat Exchanger Manual

This catalog contains an engineering section that provides the engineer with the means to make size estimates of heat transfer equipment. It helps the engineer to select a heat exchanger that will provide economy of service, precise operation, and long life. Contains thermal standards and reference data.

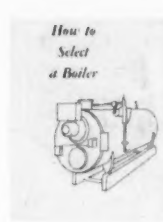
Condenser Service & Engrg. Co., Inc.



193—Heat Exchangers

Bulletin 300B describes Acme's system-engineered components. Capacities, dimensions, heat transfer data, and other necessary engineering information on shell and tube condensers, shell and coil condensers, water chillers, heat exchangers, oil separators, liquid receivers, and vertical shell and coil condensers.

Acme Industries, Inc.



194—Packaged Boilers

Catalog AD 173, "How to Select a Boiler," offers valuable suggestions to the consulting engineer and the architect on just what to look for when selecting a boiler. For example: first costs vs operating costs, packaged boiler vs the built-up boiler, and boiler design standards. Completely illustrated.

Cleaver-Brooks Co.



195—Thermo-Panel Coils

Prices and data on Dean *Thermo-Panel* coil which takes the place of pipe coils for industrial heating and cooling processes. Bulletin 259 shows how to do your own estimating. Shows valuable improvements over former designs. Contains tables showing superiority over pipe coils and tubing.

Dean Thermo-Panel Coil Div.



196—Hot Water Heaters

Catalog 512 describes the full line of RECO hot water heating equipment. This 20-page catalog includes tables, dimensions, diagrams, and other details for both horizontal and vertical storage heaters. Special linings are indicated. RECO storage heaters are time-proved standbys for providing hot water.

Richmond Engineering Co., Inc.



197—Heat Transfer Coils

Bulletin S-55 describes new smooth-fin heat-transfer coil construction that permits closer fin spacing, greater capacity per sq ft of face area, and use of higher air velocities without turbulence or excessive friction. It also illustrates many types of extended-surface heat exchangers for heating, cooling, and processing.

Aerofin Corp.

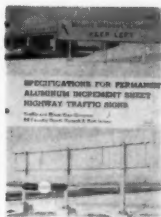


198—Water Heaters

Sims catalog J-1 provides complete engineering data in a condensed form for easy selection of instantaneous water heaters (from 15 to 70,000 gph), booster heaters (from 54 to 6000 gph), and converters (from 2.5 to 1500 gpm). Included in chart form are dimensions, capacities, weights, and prices.

Sims Co., Inc.

HIGHWAYS, BRIDGES, and STREETS



199—Highway Traffic Signs

New bulletin 58 is a specification book of 16 pages for permanent aluminum increment sheet highway traffic signs. Included are detailed drawings for the installation of various types of signs. Charts maximum sign widths for one, two, three, and four post supports.

*Traffic and Street Sign Company,
Division of Pfaff & Kendall.*



200—Information on Asphalt

Manual Series No. 5 ("Introduction to Asphalt") includes summary information on the uses, tests, and specifications for asphalt along with a brief history of asphalt. A new and revised edition of this popular publication, almost completely rewritten to reflect the latest developments in asphalt technology.

Asphalt Institute.



201—Highway Railings

One of the most complete catalogs on this subject. Contains specifications, design data, details for 47 sizes and types of cast posts, dimensions, properties of rails, and other components. A valuable handbook for the consulting engineer engaged in the design of highway railings. Forty pages.

Michael Flynn Manufacturing Co.



202—Open Metal Grid

Irving decking catalog F-300 contains illustrations, descriptions and engineering data on open metal grid bridge roadways, with many of the advantages inherent in this type of bridge roadway, such as light weight, cleanliness, drainage, safety, durability, strength, traction, and economy.

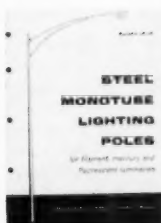
Irving Subway Grating Co., Inc.



203—Suspension Bridge Data

Catalog D-943 contains technical data making possible preliminary calculations for comparative estimates between the suspension bridge and any other contemplated type. Includes formulas for determining cable and suspender lengths, cable tensions, erection calculations, and catenary formulas.

John A. Roebling's Sons Corp.



204—Street Lighting Poles

Bulletin LS-29 presents new designs and data covering steel Monotube lighting poles for streets, highways, parking lots, shopping centers, and other locations. Poles are engineered for properly mounting today's modern luminaires. Similar information available in Bulletin LS-30 covering aluminum poles.

Union Metal Manufacturing Co.



205—Asphalt Pocket Manual

Manual Series No. 6 ("Asphalt Pocket-book of Useful Information") is a revised and vastly expanded edition of "Asphalt Useful Tables", first published in 1946. In addition to a compilation of useful tables and miscellaneous information, the new publication contains a summary of specifications.

Asphalt Institute.



206—Open Steel Bridge Flooring

Illustrated four-page bulletin on open steel bridge flooring, includes detailed drawings of steel flooring, details of concrete floor plans, and field welding diagram. Also included are load tables and diagnosis of load distribution on four-way grid. Illustrations show ease of handling.

Kerrigan Iron Works, Inc.



207—Traffic and Safety Equipment

This illustrated brochure describes Plan-et's new line of highway traffic and safety equipment. Included are overhead sign trusses, roadside directional signs, bridge railings, pedestrian overpasses, and the "Planoflash", a portable night construction warning signal that is more visible than those commonly used.

Planet Corp.



208—Reinforcing Wire Products

Catalog of American Steel & Wire products for use in highways and streets. Products included are welded wire fabric, transverse road joint load transfer assemblies, multisafety cable highway guard, beam guard, high tensile wire, and strand for prestressed concrete.

*American Steel & Wire Div.,
U. S. Steel Corp.*



209—Lighting Application Data

Bulletin B-7253 contains basic recommendations and technical data for lighting applications for expressways or freeways; major arterial streets and rural trunk highways. Includes considerations and lighting requirements expected to exist by 1970. Valuable to consultants working on highway outdoor lighting.

Westinghouse Electric Corp.



210—Signal and Sign Supports

Catalog TE-1, 20 pages, describes different types of all-aluminum supports for traffic control signals and signs. Shows typical installations, detailed drawings, and complete specifications for vertical signals, horizontal signals, truss type sign spans, pedestals, sign supports, and bases. Also signal arrangements.

Pfaff & Kendall.

INSTRUMENTS and CONTROLS

**211—Automatic Control Systems**

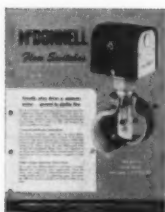
New 8-page planning guide for engineers and architects covers the 3 important phases of designing a building's automatic control system. Describes the various types of control systems, basic components for each, selection factors to consider in design, and data on centralized remote control applications.

Barber-Colman Co.

**212—Gas Alarm Systems**

Bulletin 11-36 describes Davis' continuous combustible gas alarm systems. This instrument continuously samples the flammable gas-air mixture and gives visual and audible signals when gas concentration approaches dangerous limits. Also measures toxic gases and vapors for safety control.

Davis Instruments.

**213—Automatic Safety Controls**

Bulletin FS-1 describes a dependable, moderately priced type of automatic control of safety device that makes or breaks electrical circuit when flow in a pipe starts or stops. Shows wide variety of uses — controlling signal devices, alarms, motors, burners, metering devices — details typical use in air conditioning.

McDonnell & Miller, Inc.

**214—Controls Price Lists**

A new complete set of price sheets so designed that engineers, buyers, and purchasing agents will be able to price 90% of the complete line of liquid level and flow controls manufactured by Magne-trol, Inc. Includes specifications about specific gravity, pressure, and temperature ratings of the controls.

Magne-trol, Inc.

**215—Portable Detectors**

Bulletin M1 describes Tinker and Rasor's portable detector for locating bare spots in thin protective films. Widely accepted in the corrosion control and industrial painting industry. It is non-destructive, applied voltage never exceeds 67½ volts. Bulletin furnishes specifications, operating data, and prices.

Tinker and Rasor.

**216—Field and Laboratory Testing**

New 325 Page, Soiltest, Inc. catalog illustrating and describing apparatus for field and laboratory testing of soil, concrete, asphalt, bituminous materials, rock and similar construction materials. Latest models of nuclear and electronic testing devices are included. Also listed is general laboratory equipment.

Soiltest, Inc.

**217—Liquid Level Indicators**

Bulletin 2004 describes and illustrates hydrostatic liquid level indicators for tank measurement of fuel oil and other fuels in buildings, commercial establishments, and industrial plants. Listed are distinctive features, principle of operation, and dimensions. Diagram details installation procedures.

Petrometer Corp.

**218—Control Cabinets**

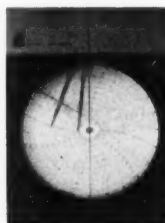
Bulletin AP 5/1 deals with complete control cabinets for any type of combustion system. Illustration shows W4-FP4 designed to provide pre-purge period and semi-automatic ignition of pilot and main flame for four burners in single boiler. Picture of cabinet included. Prices furnished on request.

Webster Engineering Co.

**219—Electromagnetic Controls**

Recent additions to ASCO Electromagnetic Control Catalog 57-S are combined in this unique "file pocket". Equipment covered includes ac relays, long life solenoids, automatic engine starting controls, automatic battery chargers, break glass switches, close differential relays, remote control switches. Kit 57-SAK.

Automatic Switch Co.

**220—Pen Recorders**

Bulletin 3025 describes recorders, up to four pen, for temperature and pressure. New features include stainless steel escutcheon plate, largest chart and glass area in industry, dust ledges, epoxy resin finish, shelf which permits quick removal of capillary from wall or panel-mounted unit. Ball-pivot movement.

United States Gauge Division.

**221—Automatic Metering System**

Bulletin FL-56 describes Hetherington & Berner's Fluidometer, an automatic batch metering system. Adaptable to practically any liquid measuring problem. Equally accurate with high or low viscosities, eliminating waste. Shown in photo and diagram are direct control, remote control, dual valve, and multi-valve systems.

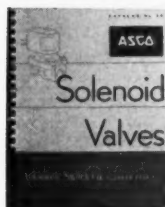
Hetherington & Berner Inc.

**222—Pneumatic Controls**

Bulletin S-103 describes the functions, applications, and operation of centralized pneumatic controls for air conditioning, heating, and ventilating systems. The advantages of using pneumatic transmission are explained and the latest developments in control center instrumentation are shown in this 12-page booklet.

Johnson Service Co.

INSTRUMENTS and CONTROLS continued



223—Solenoid Valves

This solenoid valve catalog provides complete information on the comprehensive line of ASCO solenoid valves. Listed are 2-, 3-, and 4-way valves for standard duty or for special applications (corrosion resistant, sanitary, bulk loading, and steam). An illustrated engineering section includes flow diagrams.

Automatic Switch Co.



224—Gauge Pilot Positioner

Bulletin F-029-089 describes the U. S. Gauge Pilot Positioner. This instrument combines for the first time an indicating pneumatic controller with a valve positioner. Includes advantages, applications, operating principle, and dimensions. Illustrations show essential components and operating hook-up.

United States Gauge Division



225—Meters, Feeders, and Controls

Bulletin B-I-F 5-1 describes the B-I-F Industries' line of meters, feeders, and controls for positive control of materials in motion. Each product illustrated has a description of its features, accuracy, sizes, and models, and indicates the bulletin to be requested for more specific data and applications.

B-I-F Industries, Inc.



226—Motor Controls

This condensed catalog lists, with prices, all commonly used motor controls up to and including size 4 rating. Standard enclosures are shown. Also included are various types of starters, transfer switches, control relays, push button stations, and other controls. Catalog is illustrated, includes list of renewal parts.

Allen-Bradley Co.



227—Electric Controls

Engineering reference catalog 18A contains a complete line of standard Zenith electric controls and timing devices. Photos, diagrams, engineering data, and prices on automatic transfer switches, magnetic contactors, remote control switches, program clocks, automatic reset timers, cycle timers, and special controls.

Zenith Electric Co.



228—Transmitter-Receiver Systems

Bulletin 371 describes Powers transmitter-receiver systems for remote temperature control and indication. Typical applications and data on products such as thermal and vapor-pressure type transmitters for rooms and ducts, receiver-controller with direct or reverse action and temperature indicating gauges.

Powers Regulator Co.



229—Dewpoint Indicators

Bulletin DPI-4 covers dewpoint indicator which determines water vapor content in gases by measuring dewpoint temperature. A primary measurement instrument, indicator gives accurate readings from ambient to -100F. Portable battery-operated unit can check moisture content of dried air or gases.

Weighing & Control Components, Inc.



230—Bi-color Boiler Gauges

Bulletin 2044-A describes "Multi-Port" bi-color gauge MP 1050 for boilers operating at pressures up to 1050 psig. Water always shows green and steam red. Vision slot divided into series of round ports. This permits use of small glasses and small mica which are stronger and less sensitive to thermal stress.

Diamond Power Specialty Corp.



231—Liquid Level Gauges

Data unit 356 details of operation, construction, and ratings of the new Jerguson Refragage, which uses light refraction to give black and white readings of liquid levels. Similar to reflex gages, on high pressure boilers. Pictures and diagrams graphically show the unit and its construction.

Jerguson Gage & Valve Co.



232—Portable Holiday Detectors

Bulletin EP describes Tinker and Rator's portable damp-climate, pulse type, holiday detector for surfaces coated or wrapped with high electrical resistance material. Adoptable for use on both large and small diameter pipe as well as flat surfaces. Bulletin furnishes specifications, voltage range, components.

Tinker and Rator



233—Liquid Level Indicators

How the Eye-Hye gage helps protect the power plant from liquid level accidents is explained in four-page catalog 500, Sec. CO. A diagram shows the flexibility of placement possible: near boiler, tank, or other vessel, or on instrument panelboard, nearby or considerably removed from the boiler.

Reliance Gauge Column Co.



234—Safety Controls Data

Engineering data on operating and safety controls for a wide variety of jobs involving liquid level or liquid flow. Discusses 21 case studies of special applications of McDonnell float-operated switches and valves, and flow switches. Designed to suggest a dependable, economical answer to control problems.

McDonnell & Miller, Inc.

INSTRUMENTS and CONTROLS *continued***235—Soils Load Settlement Device**

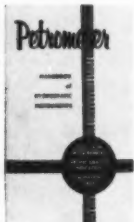
A new and compact soils load settlement device called the Levermatic consolidation apparatus is an entirely self-contained unit easily carried by one man. The unit is designed to predict, through laboratory tests, the settlement of a foundation under a dam, building, bridge, or similar structure.

Soiltest, Inc.

**236—Temperature Regulators**

Bulletin 370-1 describes Powers Series 200 temperature regulator for pneumatic air and liquid temperature control. Any heat range. Class 3 nitrogen thermal system. Easy external adjustment. Simplified direct or reverse action changes. Automatic ambient temperature compensation. Universal mounting.

Powers Regulator Co.

**237—Hydrostatic Indicators**

New 88-page handbook prepared specifically for the convenience of consulting engineers. This book describes the complete line of hydrostatic liquid level and specific gravity indicators and controls, as well as accessory equipment. Includes discussion of the theory of hydrostatic measurement and engineering data.

Petrometer Corp.

**238—"Oiltight" Control Units**

This publication describes standard duty, heavy duty, and "oiltight" control units and stations applicable for every industry. Complete information on applications, ratings, and design features are included. All types of control units, stations, enclosures, and "oiltight" controls are shown and described.

Allen-Bradley Co.

**239—Pneumatic Recorder-Controllers**

Bulletin T-1000 gives design and operating data on the Johnson line of pneumatic recorder-controllers and indicating controllers for automatic regulation of temperature, humidity, and pressure. Typical uses in air conditioning, heating, ventilating, and industrial work are explained in this 20-page booklet.

Johnson Service Co.

**240—"Eye-Hye" Remote Gauges**

Newly designed *Eye-Hye* remote gage for higher pressure is described in Sections C3.1B and C4.1D. Protruding reading medium permits observation of gage over 180° arc in front of panel. Complete description of three pressure-range model-groups, including dimension drawings. Fully illustrated with specifications.

Reliance Gauge Column Co.

INSULATION

**241—Gilsulate Applications**

Illustrated booklet S-88 gives the complete story of *Gilsulate*; what it is, what it does, how it's used, and who uses it. Booklet explains installation procedures and insulating values. Also tells of the organization in back of *Gilsulate*—checking of piping layouts and soil conditions and supervision of actual installations.

American Gilsolite Co.

**243—Foamsil Insulating Material**

Bulletin FS-1 describes Foamsil, a new insulating and refractory material. Contains background information on this new material, which is 99% pure fused silica and has a practical operating range of -450 F to 2200 F. Material is unaffected by practically all commonly used acids. Physical characteristics outlined.

Pittsburgh Corning Corp.

**242—Long Textile Insulation**

Revised catalog ULD describes the use of *Ultralite*, the long textile type insulation for duct wrap and duct liner. Characteristics of *Ultralite* duct liner, together with application methods, are listed. Facings available, including new gray fire resistant coating, shipping information, and specifications are given.

Gustin-Bacon Manufacturing Co.

**244—Protective Asbestos Coating**

Bulletin SL-8 describes fire-protection, acoustical control, anti-sweat, and heat-saving properties of sprayed *Limpet* asbestos, a simple sprayed-on blanket of 100% asbestos which adheres to all interior surfaces without hiding decorative details. Up to four hours fire-protection provided to beams and floors.

Keasbey & Mattison Co.

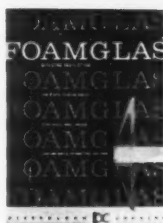
INSULATION continued



245—"Snap-On" Pipe Insulation

"G-B Snap-On Pipe Insulation," eight-page booklet, describes characteristics and application data for one piece, fine-glass pipe insulation. Application specifications cover: plumbing, heating, insulation of valves and fittings, cold piping, dual temperature, and outdoor piping. Thickness charts are also included.

Gustin-Bacon Manufacturing Co.



247—Building Insulation

Bulletin FB-105 describes Pittsburgh Corning's *Foamglas* building insulation. Used for roofs, ceilings, walls, and perimeters. It is light-weight, waterproof, and long lasting. Physical properties are given as well as general specifications. Application procedures are described and illustrated. Accessories listed.

Pittsburgh Corning Corp.



246—Insulation Specifications

Newly revised illustrated catalog IN-128A covers wide range of insulation applications specifications for petroleum, chemical, and steam generating plants. For optimum heat saving, better control of process temperatures, safety of personnel, equipment. Dimensions and properties are given.

Johns-Manville.



248—Underground Pipe Insulation

News magazine, published by the manufacturer of Gilsulate insulation for underground hot pipes, carries stories and articles on actual installations. This issue describes installation at Brandeis University and gives instructions for proper curing of the Gilsulate structure. Illustrated with photographs.

American Gilsonite Co.

LIGHTING



249—Specifications Book

Two new RLM specifications for uplight porcelain enamel and aluminum incandescent units. Important revisions in RLM specifications are covered in 1959 edition of the RLM specification book. Changes include "all-white" incandescent reflector and 8%-20% uplight fluorescent specifications.

RLM Standards Institute.



252—Wall Mounted Fixtures

New architectural brochure 30 detailing Lightolier's wall-mounted fluorescent lighting: *Prismalux*, a new bath bracket with one-piece lens/diffuser; *Reflect-A-Line*, shallow, extra-compact lines of light; *Lyteline*, decorative and functional 4-foot units with translucent or opaque front panels. Complete data.

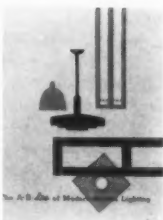
Lightolier Inc.



250—Surface Mounted Fixtures

Bulletin 61-150-6 presents a series of surface mounted units for ceilings in markets, stores, and corridors. The new stripliner luminaire is a highly efficient economy type unit where semi-direct, slim, smooth light is desired. Engineering data, dimension drawing, application, and ordering information.

Westinghouse Electric Corp.



253—Modern School Lighting

Booklet "The A-B-See of Modern School Lighting," written by a research engineer, is factual and authoritative. Various problems of classroom lighting, glare, reflection, daylight, artificial light are discussed. Types of fixtures are pictured with comparison charts and conclusions. Free to the consulting engineer.

Smoot-Holman Co.



251—Light Dimming Controls

Bulletin "The SCR Dimmer" describes Kliegl's new light dimming control employing silicon controlled rectifiers. Questions with answers give a complete word picture of this newest device. Data on this light level control includes specifications on capacities, performances, applications, size, and advantages.

Kliegl Bros.



254—Fluorescent Lamp Ballasts

Bulletin 1204 contains complete information on fluorescent lamp ballasts. Discussed are various fluorescent circuits illustrated with diagrams. Installation and operation data included on voltage supply, interference, ventilation, and cold weather operation. Includes information on testing, and measuring current.

Advance Transformer Co.

LIGHTING continued

**255—Fluorescent Luminaires**

Bulletin 61-150-7 gives a full description of the *Mainliner* fluorescent luminaire. This line offers seven different modular sizes with shieldings of different diffusers, lens, and louvers. Bulletin is illustrated with photographs and dimensional drawings. Detailed installation and application information.

Westinghouse Electric Corp.

**256—Industrial Lighting Levels**

New, Illuminating Engineering Society's "Recommended Industrial Lighting Levels" are made available in pamphlet form by the RLM Standards Institute. A reference must for those concerned with planning lighting or re-lighting projects of industrial plants, utilitarian locations, and other facilities.

RLM Standards Institute.

**257—Lighting Equipment**

Catalog 48R is a revised catalog of 140 pages listing Appleton lighting equipment. Complete in every detail. Describes industrial lights, floodlights, high bay, stocklites, walklights, and accessories. Complete mercury-vapor lighting fixtures and poles and hangers. List prices also included.

Appleton Electric Co.

**258—Fluorescent Lighting Fixtures**

New 4-page brochure pictures and describes the unique Guth swept-wing *Slimfin* fluorescent luminaire with side *Fin-Glow* light beams. *Slimfins* are shown in 3 handsome finishes — white, bronze, or silvan. Folder includes complete photometric and engineering information as well as photographs of fixtures.

Edwin F. Guth Co.

**259—Recessed Downlights**

Engineering data sheets describe installation of recessed downlights in poured concrete structures. Housing treated to withstand corrosive effects of wet concrete becomes permanent part of structural member. Electrical connections in cast aluminum splice compartment permit thru-wiring with 60° circuit wire.

McPhilben Lighting, Inc.

**260—Commercial Fluorescent Lighting**

Two catalog pages on Miller Decor-A-Lite fluorescent fixture for commercial lighting. Of special interest are decorative lancings along the side panels, which may be illuminated by white or colored light. Comes in 2-lamp, 48 inch; 4-lamp, 24 inch, and 4-lamp 48 inch. Four types of bottom enclosures.

Miller Co.

**261—Floodlight Book**

Catalog 320, the first completely new floodlight book by Crouse-Hinds since 1952, has colorful "new look", including colored divider sheets with individual contents tables, revamped page styling. Several new sections in the 184-page catalog include "How to Select Floodlights" and "Mercury Vapor Floodlights".

Crouse-Hinds Co.

**262—Fluorescent Fixtures**

AD-6856 introduces a companion fixture to the popular Catalina series. General construction identical to Catalina except C-2 features a patented, low-brightness, polystyrene lens in place of the Catalina louver. Designed to blend into the latest architectural decor with its flowing lines of light.

Benjamin Electric Mfg. Co.

**263—Commercial-Industrial Fixtures**

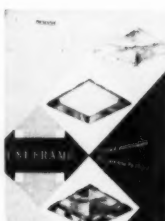
Bulletin V-810 describes a versatile line of commercial-industrial fixtures available for all lamp types, with several degrees of louver shielding, and in steel, aluminum, and plastic. Over 100 combinations provide ample selection for effective and economical direct-indirect lighting. Diagrams and pictures included.

Sylvania Lighting Products Inc.

**264—Fluorescent Lighting**

Bulletin 61-150-1 describes the complete line of LC fluorescent Carousel luminaires. Colored metal side panels and louvers diffuse a soft, smooth wash of light emphasizing specific colors without repelling others. Contains descriptive data, dimension drawings, application and ordering information.

Westinghouse Electric Corp.

**265—Recessed Lighting Fixtures**

Bulletin OD-1036 describes the new UNI-FRAME Series of recessed lighting fixtures. Shows 24 combinations available for two box sizes. Fixture illustrations and drawings show application possibilities. Dimensional cross sections, design features and complete catalog listings are included in bulletin.

Day-Brite Lighting, Inc.

**266—Surface Mounted Fixtures**

This new 24-page architectural brochure describes Lightolier's full line of surface-mounted fluorescent lighting fixtures: *Prismalux*, *Optiplex*, *Sightron*, *Modular Optiplex*, *Modular Strialux*, *Modular Sightron* and *Louvron*. Includes all technical, lighting, and installation data plus ordering information.

Lightolier Inc.

LIGHTING continued



267—Calculation of Illumination

Especially designed by mc Philben to assist consulting engineers in calculation of illumination by lumen and point-by-point methods and lighting layouts. Folio 59-2 contains a calculation guide, new IES lighting recommendations, lamp data, room indexes, and coefficients of utilization of mc Philben units.

mc Philben Lighting, Inc.



268—Commercial Lighting Fixtures

Catalog 61-320 introduces a new series of commercial lighting fixtures for service station, sports field, shopping center, parking lots, underwater, mine, general purpose or heavy duty needs. The bulletin includes fixture photographs, special features, descriptive data, price lists, and accessories available.

Westinghouse Electric Corp.



269—Aluminum Troffers

Miller Versaline and single lamp aluminum troffers are illustrated and described in a 36-page catalog, section 2. Designed for recessed mounting individually, in continuous rows and in patterns in a wide range of ceiling types. Choice of 10 different enclosures. Complete specifications.

Miller Co.



270—Louwer Diffusers

Bulletin 45 describes the new Guth NC (non-combustible) *Gratelite* louver diffuser for overall electric ceiling lighting. NC *Gratelites* are UL Listed as non-combustible and available in new 2' x 2' modules. *Gratelites* are molded of a non-combustible plastic with 3/8" open cubes. Layout and installation data.

Edwin F. Guth Co.



271—Fluorescent Lighting Fixtures

Bulletin OD-1030 describes the *Fairview*, a new fluorescent lighting fixture with the first full 8-foot prismatic enclosure. Tells about new X-5 plastic and *Cleartex* diffuser. Includes illustrated features, photometrics, catalog and installation data. The bulletin is fully illustrated in natural color.

Day-Brite Lighting, Inc.



272—Fluorescent Units

A new economy unit with designed to meet high lighting standards of modern classrooms, offices, stores and other commercial establishments. Available in either 35° x 25° or 45° x 45° units in 2 or 4 lamp arrangements. Bulletin AD 6888 furnishes full installation details and construction specifications.

Benjamin Electric Mfg. Co.

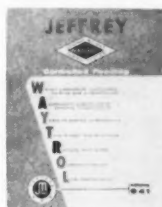
MATERIALS HANDLING and STORAGE



273—Automatic Bulk Handling

Bulletin 531, "New Techniques for Automatic Bulk Handling," is a 12-page report covering latest methods of pneumatic conveying. It details techniques for centralized automatic control, flow control, and bulk materials distribution throughout production. Installations are pictured.

Dracoo Division of Fuller Co.



275—Controlled Feeding

Catalog 941, 48-pages, *Waytrol* (Controlled Feeding) catalog covers the Jeffrey line of weighing, batching, and proportioning systems used by the process industries. The many advantages of *Waytrol* are outlined. Types of constant weight feeders are detailed with ample drawings and photographs.

Jeffrey Manufacturing Co.



274—Overhead Traveling Cranes

Bulletin 5000A covers Conco custom-engineered overhead electric traveling cranes, of double girder construction. Can be furnished in a wide range of capacities and spans. Also included are hand-powered overhead traveling cranes, hand-powered and electric hoists.

Conco Engineering Works,
Division of H. D. Conkey & Co.



276—Power Hoists

Bulletin 34A, 20 pages, describes the Clyde line of electric, gasoline, and diesel hoists. Gives construction details of medium capacity hoists of various line pulls. Also includes information as to selecting the hoist, information required for hoist quotation, and table of drum cable capacities. Available accessories are listed.

Clyde Iron Works, Inc.

MATERIALS HANDLING and STORAGE continued

**277—Loss-In-Weight Feeding Systems**

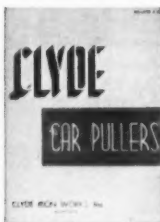
Bulletin 32-R2 describes Omega line of continuous loss-in-weight feeding systems engineered to handle and feed flowable solids and liquids at precisely controlled rates. Bulletin illustrates simplex and duplex feeding systems, describes weighing, controlling and feeding operations; dimensions; capacities.

B-I-F Industries, Inc.

**278—Gantry Cranes**

Catalog AP-20 illustrates and describes especially designed installations of American's cranes. Shown are a 325 ton powerhouse gantry crane at Noxon Rapids, Montana and a 150 ton capacity gantry crane at the Big Bend Project in California. Installations of revolver cranes.

American Hoist Pacific Co., subsidiary of American Hoist & Derrick Co.

**279—Car Pullers**

Ten-page bulletin L-6 shows capstan type car puller for moving cars a short distance using manila rope. Three styles of drum car pullers for heavy duty car moving, shuttle work, or for servicing very large areas are also listed, as well as barge movers for shifting barges back and forth during unloading.

Clyde Iron Works, Inc.

**280—Bulk Materials Controls**

Automatic measurement and control of bulk materials through unitized weighing systems of pre-engineered components is the subject of catalog 12. The bulletin explains the application of a standardized system of instrumentation to batch and continuous weighing methods for a wide range of control purposes.

Weighing & Control Components, Inc.

**281—Feedrail**

Bulletin 75 describes in detail Feedrail Corporation's 100 ampere Feedrail. Features and advantages are outlined. Design and construction graphically illustrated with cutaway photographs. Catalog includes track sections, switches, trolleys, turntables, and accessories. Installation procedures included.

Feedrail Corp.

**282—Overhead Handling Equipment**

Automatic Electric Company's award-winning plant at Northlake, Illinois, utilizes Whiting *Trambeam* at a number of important areas. Four-page, full-color bulletin M-33 describes how this overhead handling equipment increases storage capacity, keeps materials moving at AE's efficient 35-acre installation.

Whiting Corp.

**283—Cranes**

Bulletin 91 describes in detail Whiting's all-new *Thrif-T* crane, a rugged unit designed with economy in mind. Crane is available in 20, 25, and 30 ton capacities. Bulletin features line drawing showing important crane features and provides pertinent specifications. Photographs show crane in operation.

Whiting Corp.

**284—Building Elevators**

Catalog 534-C, a 20-page pictorial presentation in color, illustrates many important buildings equipped with Houghton Elevators. Office buildings, hospitals, hotels, apartments, industrial plants, and special-purpose structures are pictured. A complete listing of Houghton branch offices is included.

Houghton Elevator Co.

**285—Tanks and Chests**

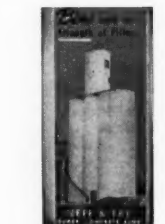
Kalamazoo vitrified glazed tile tanks and chests are described in four-page bulletin 1-55-T. Drawings and photos show how the two types of tile blocks available provide flexibility of wall design. Types, sizes, design, erection, and cost are discussed, and typical installations in industry are pictured.

Kalamazoo Tank & Silo Co.

**286—Industrial Silos**

Catalog 9129 gives construction details, sizes, and capacities of Marietta industrial silos. Line drawings show construction details and photographs show installations. Complete information on Marietta's construction service. Shows the four types of concrete staves offered.

*Marietta Concrete Division
American-Marietta Co.*

**287—Concrete Storage Bins**

Construction of Super-Concrete stave storage bins for industry is explained in the folder, "Bins with the Strength of Pillars." Contains tables of capacities and photographs of typical installations. Lists of prominent users, varieties of materials stored, and other uses for the bins are given in this valuable bulletin.

Neff & Fry Co.

**288—Automatic Handling Systems**

Catalog 67-A describes, illustrates (photographs and diagrams) engineered and automated handling systems. The 16-page "Plan with Planet" brochure also illustrates equipment for bulk and unit materials, automated and special handling machinery, and foundry equipment, and describes Planet's creative service.

Planet Corp.

MATERIALS HANDLING and STORAGE continued



289—Elevated Water Tanks

This new folder, printed in full color, describes design features and advantages of a wholly new form of elevated water tank, the Graver "Aquatore". This tank, designed as a torus tank on a flared column, provides large-capacity storage, 300,000 to 3,000,000 gallons. Diagrams also show conventional tanks. Graver Tank & Mfg. Co.



290—Tank Designing Data

This handy reference booklet contains tables of circles and spheres, area and volume formulas, decimals of an inch and foot, tile shapes, standard reinforcing bars, wood pulp fiber in solution, capacities of tanks, conversion factors, and other information for use in designing tanks. Bulletin TC-155.

Stebbins Engineering and Mfg. Co.



291—Concrete Storage Bins

Bulletin describes Super-Concrete storage bins for industry. Explains how bins are engineered specifically to purchaser's requirements. Describes the installation of concrete roofs and elevated floors, when desired. Lists materials stored and gives prominent users. Contains tables of capacities and photographs.

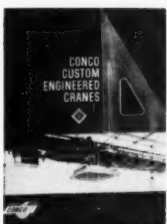
Neff & Fry Co.



292—Materials Handling, Processing

Fully illustrated brochure 182, 36 pages, presents a report of R&S diversified services for coal and iron ore mining, steel mills, and railroads. It features materials handling and processing facilities; also ore beneficiation plants other than specialized coal preparation plants and fabrication in well equipped shops.

Roberts & Schaefer Co.



293—Custom Engineered Cranes

A new 12-page catalog covering in detail custom-engineered Conco overhead electric traveling cranes, including various bridge types and various electric trolley hoist types, as well as specially designed handling equipment employing crane principles and components. Illustrated with drawings and pictures.

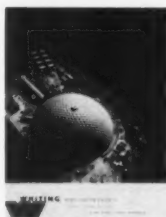
Conco Engineering Works.



294—Pneumatic Conveyors

Spencer bulletin 143-B describes pneumatic conveying with stationary and portable systems. A typical diagram of each type is given; also a chart of approximate capacities and photographs showing various system components. Examples with illustrations of applications of pneumatic conveyors are shown.

Spencer Turbine Co.



295—Trackmobile

Bulletin 245 describes in four full-color pages the important role played by a Whiting *Trackmobile* and a unique Whiting radial transfer table in the operation of Union Tank Car Company's unusual circular maintenance shop. Full description of the shop shows why it is considered one of the most advanced.

Whiting Corp.



296—Wood Tanks

Eight-page bulletin 655-W explains why wood tanks can meet conditions other types of tanks cannot. It describes round, rectangular, and special tanks, as well as vats, boxes, sinks, and flumes. Lists possible uses for each along with the type of hardware and lining available, and gives installation photographs.

Kalamazoo Tank & Silo Co.



297—Elevator Systems

Catalog SW-1 describes the complete line of Haughton Elevators, with special detailed information given on Haughton "Auto-Signmatic" systems for complete automation of multiple-unit elevator groups. Includes recommended sizes and dimensions for passenger, freight, hospital elevators, and dumbwaiters.

Haughton Elevator Co.



298—Feedrail System

Bulletin 60 describes 60 ampere Feedrail. This system is made up of standardized units, factory assembled for easy installation. Advantages are outlined. Design and construction are shown in cutaway photographs. All products, including accessories, are illustrated. Typical layouts and installation procedures.

Feedrail Corp.



299—Classifying System

Bulletin describes two types of classifying systems, both combining high efficiency with low power requirements and moderate cost. Units separate dry fine powdered or fibrous material from coarse within a fine product range of 10 to 400 mesh. Power requirements from 0.04 to 0.5 fan hp per ton of feed per hour.

Buell Engineering Co., Inc.



300—Conveyor Systems

Bulletin G-3B describes Fuller rotary compressors and vacuum pumps; horizontal-grate material coolers; Fuller preheater, Humboldt suspension type; Fuller-Kinyon *Airveyor*, and F-H *Airslide* conveying systems for handling dry, pulverized, granular, and crushed materials. Fully illustrated.

Fuller Co.

MATERIALS HANDLING and STORAGE *continued***301—Material Moving Equipment**

Bulletin 244 takes you to plants, yards, and shops of varying sizes showing Whiting equipment at work in different and unusual installations, many custom built. Case study write-ups deal with crane, Trambeam monorail, transportation, foundry, and chemical processing equipment. Booklet is fully illustrated.

Whiting Corp.

**302—Spiral Conveyors**

Catalog 951, 48 pages, covers complete line of standard and special spiral (or screw) conveyors for industry. Catalog contains engineering information as well as specifying instructions for laying out spiral conveyor applications. Completely illustrated with photographs and line drawings.

Jeffrey Manufacturing Co.

MECHANICAL POWER TRANSMISSION

**303—Gearmotors**

Bulletin 51B9172 describes gearmotors available from 1/4 to 100 hp. Bulletin covers integral and all-motor types including right angle as well as special designs. Allis-Chalmers complete line permits users and original equipment manufacturers to select just the right gearmotor for a particular need. Well illustrated.

Allis-Chalmers

**304—Gear Drives**

Bulletin MU-237 describes and illustrates foot-mounted speed reducers and integral and all-motor type gearmotors in 1 to 125 hp ratings with output speeds ranging from 1.2 to 780 rpm. Also listed are compact flange-mounted and shaft-mounted belt-driven speed reducers for direct attachment to the input shaft.

Wagner Electric Corp.

**305—Motor Reducer Drives**

Fully illustrated booklet B-7223, 33 pages, includes recommendations, ratings, dimensions, and other application data to assist the consulting engineer in selecting the proper gearmotor or package motor reducer drive for his particular application. Describes Module gear units for maximum adaptability.

Westinghouse Electric Corp.

**306—Gearmotors**

Bulletin J-17 contains technical information on horizontal and vertical mounted Gearmotors with capacity range up to 125 hp and a variety of output speeds from 780 rpm to 1.2 rpm. Designed for low initial cost and ease of installation. Includes photographs of various types, comparison features, and specifications.

Hewitt-Robins

**307—Shaft-Mounted Speed Reducers**

Bulletin J-19 describes Jones shaft-mounted speed reducers. Six standard sizes. Single and double reduction units to 40 hp. Double lip type seals give positive sealing against oil leakage. Contains selection information, comparison features, dimensions, cutaway photographs showing construction.

Hewitt-Robins

To order personal copies of these bulletins, please fill out the card between pages 2 and 3 or 54 and 55.

**308—Speed Reducers**

Bulletin GH-59 describes a new line of ground tooth speed reducers and speed increasers. These power transmission units are the first complete line of parallel shaft units with precision ground gearing available in single, double, triple, and quadruple reductions. Complete selection data and specifications.

Philadelphia Gear Corp.

**309—Flexible Gear Couplings**

Advantages and typical applications of flexible gear couplings are pictured and described in 16-page catalog C-5, "The Revolutionary New Sier-Bath Flexible Gear Couplings." Couplings are available in standard, vertical, millmotor, floating shaft, spacer type, and in many special purpose types.

Sier-Bath Gear & Pump Co., Inc.

OFFICE EQUIPMENT and SERVICES



310—Electronic Computer

Brochure S-516 describes how the Royal Precision LGP-30 electronic computer is used to optimize new designs of optical systems at Simpson Optical Mfg. Co. of Chicago. Basic ray trace application is detailed with illustrations of data load sheet and program flow chart. Automatic design of lens system explained.

Royal McBee Corp.



311—"Time Saving Tips"

Booklet "Time Saving Tips" for the draftsman and the engineer, published by the Frederick Post Company contains 59 short-cuts to speed drafting and computation work. Many are time-tested ideas and others are new approaches to old problems. Some 52 contributors made this booklet possible.

Frederick Post Co.



312—Metal Plan Files

Bulletin AD-C2440-58 describes in detail Art Metal's Planfile for the vertical filing of plans, drawings, blue prints, tracings, and sketches. Line drawings and photographs show construction and operation. Planfile drawer units are also available. Complete specifications, planning suggestions, and instructions.

Art Metal Construction Co.



313—Whiteprinting Machine

Bulletin A-2512 describes Bruning's new Copyflex Model 435 whiteprinting machine. This new machine combines high volume operation with moderate prices and low cost per copy. Features of the machine are listed and illustrated and specifications given. Cutaway photograph with keyed captions.

Charles Bruning Co., Inc.



314—Dimensional Stable Film

Brochure SP58-27 tells about Ozalid's diazo sensitized and unsensitized Scalemaster, a highly dimensional stable film that remains naturally flexible forever. A timesaver, draftsmen draw and dimension in one precisely accurate operation on this 85% translucent film. Scalemaster is available in rolls or sheets.

Ozalid Div., General Aniline & Film Corp.



315—Portable Tracing Units

Brochure describes line of thin, lightweight portable tracing units which speed tracing of maps, and illustrations. Also used to trace artwork on Bristol board and to opaque and strip-in negatives. May be hung on wall to display transparencies. Fluorescent illumination, shatter-proof top.

Porta-Trace, Inc.



316—Drafting Machine

Bulletin A-2488 describes Bruning's new Neo-Glide drafting machine. A new addition to the Bruning line, this machine will operate at any angle without readjustments or bulky counterweights. Replaces five basic instruments; is easy to install; retains angle automatically. Features are described and illustrated.

Charles Bruning Co., Inc.



317—Whiteprinting Machine

Catalog SP58-33 discusses seven Ozalid whiteprint machines. Illustrated, the 18-page booklet gives specifications, features, and advantages. Tells how to cut costs, speed production in any size office with whiteprinters that copy letters, tracings, drawings from 9" to 57" wide and from 10 fpm up to 100 fpm.

Ozalid Div., General Aniline & Film Corp.

To order personal copies of these bulletins, please fill out the card between pages 2 and 3 or 54 and 55.



318—Plastic-Film Dust Boots

Specification sheets describe high-flex plastic-film dust boots which seal hermetically against dust, grit, or corrosives and offer minimum collapsed height for cylinder rods, traverse screws, and slides. All moderately priced and available in standard sizes from 1" to 6". Also custom shapes, sizes, and colors.

Porta-Trace, Inc.



319—Drafting Room Furniture

Catalog entitled drafting room furniture includes various types of drafting tables, chairs and stools, and plan files. All types are illustrated. Includes dimensions, drawer dimensions, floor plans, and specifications. Well known brand furniture, Post, Hamilton, Cramer, Royal, plus other popular makes are listed.

Frederick Post Co.



320—Electronic Digital Computer

Brochure S-526R1 describes the Royal Precision LGP-30, a desk-sized, stored-program, general purpose electronic digital computer. Specifications and features are listed and illustrated. New optional photo-electric punched tape reader and high-speed punch unit illustrated. Components described and pictured.

Royal McBee Corp.

PIPING, VALVES, and PLUMBING



321—Check Valves

Bulletin 8K describes a line of swing-type check valves for extraction or bleeder lines and special applications on shipboard and in connection with atomic reactors. Includes application, construction, and operational information. Exclusive features described and illustrated. Accessories listed.

Schutte and Koerting Co.



322—Drinking Fountains

Bulletin 359 gives specifications for Haws freeze-proof fountain assemblies for wall and pedestal fountains. Detail drawings show typical installations for year 'round service anywhere. Reduces maintenance costs. Also illustrates the Haws fountains especially adaptable to freeze-proof valve and drain assemblies.

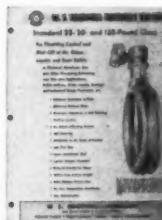
Haws Drinking Faucet Co.



323—Stainless Steel Strainers

Bulletin SS-143 describes Strong's new line of all-stainless steel (Type 316) strainers. Stock sizes are 1/2" to 2" in socket weld or screwed connections. Protects high pressure and high temperature steam, liquid, gas, or chemical lines. Sizes, pressure and temperature ranges, specifications, and prices are included.

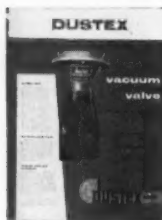
Strong, Carlisle & Hammond.



324—Butterfly Valves

Bulletin 582 describes Rockwell butterfly valves, standard 25, 50, and 125 lb class, for throttling, control, and shut-off of air, gases, liquids, and semi-solids in processing, utility, and industrial applications. Features of this valve are described and pictured. Accessories are listed. Dimensions and specifications.

W. S. Rockwell Co.



325—Hopper Discharge Valves

Bulletin describes a new valve for hopper and bin discharge. Forms an airtight seal under negative pressure, releasing material from the hopper when weight of the material forces it through the valve. Valve has no mechanical parts consisting only of a Neoprene sleeve resistant to most chemicals, high temperatures.

Dustex Corp.



326—Steam Traps

Bulletin 808 describes the new 500-C series steam traps, combination open float and thermostatic type. Cutaway drawings show both thermostat and bucket operation. Photographs show accessibility of parts for service. Gives specifications needed for ordering. Included are capacity data and specifications.

Wright-Austin Co.



327—Expansion Joints

New twelve-page Bulletin EJ-1917 (59) gives complete data on Yarway Type W Gun-Pakt expansion joints. Details of design and construction, including complete charts of weights and dimensions, are presented with instructions on installing pipe line expansion and best installation and maintenance procedures.

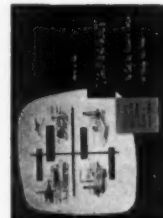
Yarnall-Waring Co.



328—Fire Hydrants

An AWWA compression type, dry head fire hydrant with swivel flange below nozzles permitting nozzle section to be rotated 360° without removing bolts. Outer protection case permits removal of complete barrel for replacement or repairs without excavating. Bell, mechanical joint or flange pipe connections.

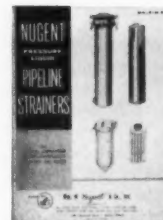
R. D. Wood Co.



329—Coal Tar Protection

Hot coal tar protection in easy-to-apply tape form for pipe, pipe fittings and joints, conduit, cable, insulated pipe, tie rods. Material is heated lightly to soften the pitch, then spirally wrapped onto pipe surface. Tapecoat provides long-life protection that is equivalent to a hot-applied coal-tar pipeline coating.

Tapecoat Co.



330—Liquid Strainers

Bulletin 6 deals with liquid strainers, single and duplex, for pressures from gravity to 900 psi. Capacities from 6 to 7500 gpm of water or 50 viscosity oil at 6 psi pressure drop. Mesh size 8 to 200, depending on liquid and contaminant. Strainer basket catches all contaminant; none is left in shell or piping.

William W. Nugent & Co., Inc.



331—Cast Steel Valves

New 8-page brochure lists information on OIC's complete line of cast steel gate, globe, angle, and check valves. It also completely identifies all the various designs available in the long line of OIC forged steel gates in union and bolted bonnets, inside screw and OS&Y. Globes and angles are also listed.

Ohio Injector Co.



332—Plastic Pipe, Fittings, Valves

Bulletin of engineering information on PVC plastic pipe, fittings, and valves. Specification, design, and installation information is included as well as a comprehensive corrosion resistance comparison chart for seven types of plastic pipe carrying 162 chemicals. Charts show fluid and gas flow characteristics.

Kraloy Plastic Pipe Co., Inc.

PIPING, VALVES, and PLUMBING continued



333—Valve Selection

New bulletin 115 covers some basic points to consider when selecting valves for process piping systems and emphasizes the many advantages and savings that can be made by the proper selection of valves to meet piping characteristics. Some typical process applications are also covered. Cut-away drawing shows valve operation.

Hills-McCanna Co.



334—Hard Rubber Pipe, Fittings

New, complete, twelve-page, two-color bulletin PF-1300 describes hard rubber pipe, fittings, and valves; dimensions, chemical and physical properties of heat-resistant Buna-N compound and natural rubber, as well as general information. Cross-section dimensional drawings of all types of valves are shown.

Luzerne Rubber Co.



335—Drinking Water Coolers

Bulletin T-472 describes complete line of self-contained drinking water coolers. Capacities from 3 to 27 gph; air-cooled or water-cooled condensing units. Includes new wall mounted type, explosion proof, stainless steel, hot and cold, and wall remote models. Complete specifications, capacities, and other data.

Temprite Products Corp.



336—Steel Fittings

Catalog H-1 provides information about the complete "Husky" line of low-pressure 150 lb carbon steel fittings: straight tees, 90° elbows, 45° elbows, and reducers. Practical advantages of "Husky" fittings are included. Also shown are Schedule 40 and Schedule 80 high pressure specification tees. Specifications.

NIBCO Inc.



337—Flexible Ball Joints

Bulletin 31A contains layout diagrams, photographs, and data on how to solve problems of thermal expansion and contraction in piping economically with flexible ball joints. Applicable to piping runs of any length and of any diameter from 1/4 inch to 12 inches, including high temperatures steel piping.

Barco Manufacturing Co.



338—Surface Wash Water Valves

Bulletin W-17 describes valves specially made for surface wash water application on filters and for control of water flow to filters. Valves may be controlled from operating table by electricity, air, or water. There is no working against line pressure. Instead, line pressure against piston operates valve.

Golden Anderson Valve Specialty Co.



339—Jointing Flexible Gaskets

Technical brochure describes and illustrates the use of "Tylox C" and "C-P" sewer pipe jointing flexible gaskets. Gaskets are for single or double offset pipe of all sizes. Diagrams show gaskets properly positioned and under full compression. Photographs show installation procedures. Coupling methods diagrammed.

Hamilton Kent Manufacturing Co.



340—Bronze Valves

Bulletin U-01 describes Fairbanks' renewable composition disc bronze valves in the globe, angle, and lift check types. Types of discs with which these valves may be furnished and modifications which will provide spring loaded check valves and automatic stop and check globe and angle valves are detailed.

Fairbanks Co.



341—Boiler Service Valves

Bulletin E125, 22 pages, "Everlasting Boiler Service Valves," contains quick and slow opening straightway valves—Model W, angle valves, "Y" valves, duplex blow-off units, water column valves—Model W, and fire protection valves—opening and closing types. Includes a full page of material specifications.

Everlasting Valve Co.



342—Wrought Iron Pipe

Comprehensive 64-page booklet discusses 4-D wrought iron pipe for downspouts, soil, waste, and vent lines. Includes sections on corrosive conditions, comparative service, Durham systems, cost considerations, and specifying data. Photographs of vent corrosion accompany two building piping surveys.

A. M. Byers Co.



343—"Impactogear"

Catalog 14-C describes the new "Impactogear," a ring gear and pinion assembly permitting a man with a portable power wrench to operate large cast steel globe valves without assistance. Can be fitted to any 10-, 12-, or 16-inch valve of 900 psi or higher pressure.

Edward Valves, Inc., subsidiary of Rockwell Manufacturing Co.



344—Universal Joints

Bulletin CS-10 describes and illustrates the five standard sizes of bevel gear universal joints available. For remote control of valves, pumps, engines, antennae, ventilators, equipment in inaccessible locations. Operate at any angle from 0° to 135° on vertical center line, or from 0° to 360° on horizontal center line.

Condenser Service & Engrg. Co., Inc.

PIPING, VALVES, and PLUMBING continued

**345—Glass Lined Sewer Pipe**

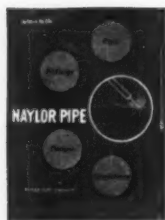
Folder deals with the glass-lined sewer pipe with a mechanical joint. *Amoit Glas-Glaz* pipe is available in 4-ft lengths. It is root and infiltration proof and is glass lined inside and out. The pipe has been designed for an under-the-house drain and also as a house-to-street sewer.

American Vitritified Products Co.

**346—Water Coolers**

This new 20-page, two-color booklet 892 describes the complete Ebco line of water coolers. Emphasis is placed on this company's new cooler which furnishes both hot and cold water permitting the making of beverages. Features of the cooler are described in words and pictures. Booklet also describes accessories.

Ebco Manufacturing Co.

**347—Lightweight Pipe**

New 8-page condensed catalog summarizes complete line of Naylor lightweight pipe, fittings, flanges, and connections. Lists typical applications. Includes standard specifications on pipe from 4 to 30 inches diameter, together with details on standard fittings and flanges. Covers couplings for pipelines.

Naylor Pipe Co.

**348—Corrosion-Resistant Valves**

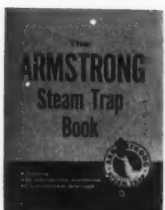
Bulletin 201 acquaints potential users with the completeness of the Powell corrosion-resistant valve line. It is profusely illustrated, lists the large variety of metals and alloys in which valves are available. Includes pressure-temperature ratings, dimensions, features of construction, and general specifications.

Wm. Powell Co.

**349—Fire Hydrants**

Bulletin W-8879 describes Mueller's fire hydrants and gate valves. Photographs illustrate two and three way hydrants and each type of gate valve. Cutaway wash drawings show construction and operation. Precision engineered, these products meet the exacting specifications of the AWWA. Specifications included.

Mueller Co.

**350—Steam Traps**

Catalog K, the Armstrong steam trap book, has been revised and expanded to 48 pages. New material includes complete data on Armstrong open float and thermostatic steam traps; strainers in 1/2 to 6-inch sizes in semi-steel; new pipe size tables; and additional data on trap selection.

Armstrong Machine Works.

**351—Gate Valves**

Catalog 1200 describes W-K-M's new pressure sealing gate valves with unique double-action floating seats for positive seals both up and downstream. Through-conduit, stainless stem, slab-type gate, anti-friction bearings, and many other features are described. 2" thru 12", ASA 150 lb and 300 lb.

W-K-M, Division of ACF Industries, Inc.

**352—Alloy Mechanical Tubing**

Bulletin TB-430, "How to Cut Cost by Using Alloy Mechanical Tubing," issued by the Babcock & Wilcox Company. Folder discusses initial cost, structural advantages, types of steel, types of tubes, and procurement tips. Lists types of tubing manufactured by Babcock & Wilcox and the various sales offices.

Babcock & Wilcox Co.

**353—Snow Melting Systems**

"Steel Pipe Snow Melting and Ice Removal Systems," 32 pages, presents the case for snow melting systems and shows typical installations in commercial and industrial locations. Design data is complete with information on anti-freeze mixtures, sizes, and spacing.

Committee on Steel Pipe Research, American Iron and Steel Institute.

**354—Reducing Valves**

Bulletin D-92B describes Fisher Governor pilot operated reducing valves for steam service. Available in sizes from 1/2" through 6", with 250 lb screwed connections, and 1 1/2" through 6" in 125 lb or 250 lb flanged connections. It is a self-contained unit, obtaining pilot operating medium from the inlet.

Fisher Governor Co.

**355—Sampling Valves**

New catalog, data unit 355, gives features, construction details, sizes, ratings, and materials of Jerguson No. 23 drain or sampling valve. This valve utilizes a unique bolted bonnet for "freeze-proof" action under all conditions. Diagrams show construction with keyed chart indicating component parts.

Jerguson Gage & Valve Co.

**356—Insulated Piping Systems**

The new edition of the Ric-wil product catalog covers construction features for prefabricated, insulated piping systems for steam, hot water, oil, or refrigeration distribution lines. Types of systems covered include *Hel-cor*, *Uniline*, *Type J*, and cast iron. Prefabricated accessories are also included.

Ric-wil, Inc.

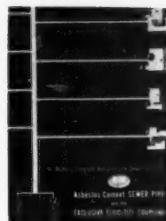
PIPING, VALVES, and PLUMBING continued



357—Gate and Check Valves

Catalog 57 describes Darling's line of gate valves and check valves in iron, bronze, steel, and special alloys for all types of valve application. Also included are fire hydrants and accessories for fire protection. This 244 page bound volume gives specifications; pictures facilities; and illustrates product applications.

Darling Valve & Manufacturing Co.



358—Gravity Sewer Pipe

This new bulletin describes "K&M" asbestos-cement gravity sewer pipe with the exclusive, patented *Fluid-Tite Coupling*. Offers data on installation and operation plus information on infiltration tests, dimensions, and tolerances of pipe and couplings, and connections for joining pipe to building sewer pipe.

Keasbey & Mattison Co.



359—Pipe, Fittings, and Valves

Bulletin 139 describes Barnstead's complete line of tin-lined pipes, fittings, and valves. Combining the chemical protection of pure tin with the strength and durability of threaded pipe, this tin-lined equipment protects the purity of distilled water from the point of origin to the point of ultimate use.

Barnstead Still & Sterilizer Co.



360—Control Valves

Bulletin 150 describes the complete line of DeZurik control valves. Included are both on-off and throttling valves with pneumatic, hydraulic, and electric actuators. Listed are a full complement of accessories. Specifications and selection data in bulletin. Dimensional and installation drawings included.

DeZurik Corporation.



361—Power Valve Control

"Limitorque Control," 30-page catalog L-550, gives background information on this automatic, power activated device for controlling all types of valves and sluice gates. It describes the available types and lists specific applications. Installations are shown in power plants, refineries, and in various industries.

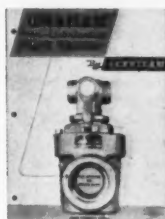
Limitorque Corp.



362—Plastic Pipe

Bulletin describes Southwestern lightweight plastic pipe. This pipe is easy to handle, store, and transport. It is simple to install; resists chemicals; is unaffected by electrolytic corrosion; reduces installation and maintenance costs. Available in all sizes with ready-to-use fittings. NSF approved for drinking water.

Southwestern Plastic Pipe Co.



363—Plug Valves

Twelve-page catalog 581 GP contains specifications of all sizes (1 to 4 in.) and pressures (1000 psi to 10,000 psi CWP) of Graham nonlubricated plug valves. Cutaway view shows construction details of this round port, full opening valve. Photos of all valves; parts lists; body and trim materials also included.

Texstream Corp.



364—Jacketed Pipe and Fittings

Bulletin J-57 describes pipe, welded steel fittings, spring loaded plug valves, and valves all jacketed, manufactured by Hetherington & Berner Inc. Different types of valves and fittings are illustrated together with cutaway photographs showing construction and operation. Also jacketed pumps and flexible hose.

Hetherington & Berner Inc.



365—Stainless Steel Fittings

This 22-page catalog explains how Speedline stainless steel fittings reduce piping costs by allowing the designer to take advantage of the new and more economical schedules 5 and 10 stainless steel pipe. A schematic drawing illustrates industrial applications.

*Speedline Stainless Steel Fittings Div.,
Horace T. Potts Co.*



366—Three-Way Valves

Bulletin 8F describes line of three-way valves offering considerable installation savings over conventional two-way types. Installed at a heater bypass connection on the heater inlet or outlet side, these valves can replace two gate valves, one tee fitting, and eliminate four welded connections. Operation diagrammed.

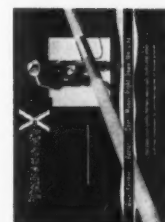
Schutte and Koerting Co.



367—Butterfly Valves

Bulletin 583 contains information for easy selection of the valve needed for required pressure drop in the size and construction for air, gas, or liquid lines. Valves are pictured and diagrams show construction. Allowable pressure drop for Rockwell's seven classes of valves are charted. Control methods described.

W. S. Rockwell Co.



368—Protective Coating

Tapecoat X is a coal tar protective coating in tape form for pipe, pipe fittings and joints, conduit, cable, insulated pipe, tie rods. Material is heated lightly with a torch, then wrapped onto pipe surface with one-half inch overlap. Provides protection on underground pipe equivalent to hot-applied coal tar.

Tapecoat Co.

PIPING, VALVES, and PLUMBING continued

**369—Lubricated Plug Valves**

How ACF lubricated plug valves can save money and add efficiency to hot and chilled water air conditioning systems is described in Bulletin AP 1059. These valves are ideal for use as balancing cocks, condenser return, boiler and chiller feed, gas, water, or oil supply valves. Illustrated.

W-K-M, Division of ACF Industries, Inc.

**370—River Crossing Pipe**

Booklet L-115 describes American Molox ball joint pipe for river crossings and other difficult installations. Map shows various locations of installations. Gives description, suggestions for use, method of assembling. Many pictures are used showing actual installing of pipe. Complete specifications on all diameters.

American Cast Iron Pipe Co.

**371—Ball-Type Flexible Struts**

Catalog 229A describes Barco's ball type flexible struts for refineries, power plants, chemical plants, paper mills, steel plants, and steam and processing piping. Cutaway photographs show construction and diagrams show dimensions. Included are engineering applications, advantages, capacities, and general specifications.

Barco Manufacturing Co.

**372—"Hot'n Cold" Water Coolers**

Booklet entitled "How to cut coffee-break time in half" is offered by Ebco. This booklet describes the new Hot'n Cold water cooler with a beverage locker. Complete line of Hot'n Cold coolers are illustrated. Also shown in pictures are the various applications. Shown in chart form are possible yearly savings.

Ebco Manufacturing Co.

**373—Fabricated Pipe Fittings**

Bulletin 525 illustrates standard and special fabricated fittings which help in planning piping and equipment layouts. Data includes specifications and prints on standard fittings for lightweight pipe. The bulletin also illustrates special fabrications designed to save time and labor.

Naylor Pipe Co.

**374—Gate Valves**

Bulletin 198 describes and illustrates newly designed 125-pound and 150-pound bronze, screwed end, union bonnet gate valves, inside screw rising stem and non-rising stem. Features of construction are enumerated and emphasized, and complete dimensions of available sizes ($\frac{1}{4}$ " to 3") are listed.

Wm. Powell Co.

**375—Check Valves**

Bulletin V-63 lists types, applications, features, and sizes of bronze and iron check valves. Bronze include lift and swing types with screwed, flanged, solder, and Fairco-Braze ends and Underwriters' Approved valves for LP-gas service. Iron, bronze-mounted swing type, include approved valves.

Fairbanks Co.

**376—Filtration Plant Valves**

The only valves specifically made for water filtration plants are shown in bulletin W-18. Complete specifications are given for drain, backwash and rewash valves. Valves can be remotely operated by electricity, air, or water. Actual opening and closing power is supplied by the line pressure itself.

Golden Anderson Valve Specialty Co.

**377—Tapping Machine**

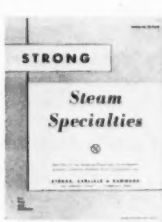
Bulletin W-8912 describes Mueller's double pressure chamber tapping machine, the B-100. This machine makes faster taps; assures pressure tight connections; provides trouble-free operation. Can be used by hand or power. Cutaway shows construction and operation. Lists and pictures equipment.

Mueller Co.

**378—Disc Liquid Filters**

Bulletin 7C, 16 pages, illustrates and describes the full line of crenulated laminated disc liquid filters for removing small micron-size foreign solids from most liquids in one pass through at a rate of 1 gpm at 1 psi pressure drop to 1260 gpm at 3 psi pressure drop, of 35 ssu viscosity fluid.

William W. Nugent & Co., Inc.

**379—Steam Specialties**

Bulletin SS-140-C contains detailed data on Strong's extensive line of in-line steam traps, strainers, and pressure reducing valves. Applications, detailed specifications, list prices, and cutaway drawings are included, along with the wide range of fitting sizes, materials, and temperature and pressure capacities.

Strong, Carlisle & Hammond

**380—Blow-Off Valves**

Bulletin B-435 (59), Supplement A, describes new Yarrow hard seat-sealless unit tandem blow-off valve for medium boiler blow-off pressures of 665 psi (basic pressure rating 400 psi) or 515 psi (basic pressure rating up to 300 psi). Four-page bulletin gives all data on blowing and sealing valves and how to specify.

Yarnall-Waring Company.

PIPING, VALVES, and PLUMBING *continued*



381—PVC Pipe

Revised edition contains new corrosion ratings, expanded information on thermal compensation, vacuum service, abrasion resistance. Installation and application sections have been enlarged. Diagrams illustrate joining of PVC to other piping materials. Includes dimensional data and working pressures for Schedule A tubing. *A. M. Byers Co.*



382—Valves

Dimensions and detail drawings plus a parts list are included in 20-page bulletin E-165. Bulletin discusses class 125 single and double disc, class 250, cylinder-operated valves, lubricated valves, valves for emergency protection, steam-jacketed valves, and valves for boiler blow-off. Fully illustrated.

Everlasting Valve Co.



383—Flexible Gaskets

Technical brochure describes and illustrates the use of Hamilton Kent's "Tylox C-R" flexible gaskets for coupling recessed pipe of all sizes. Gaskets are of a special cross-sectional design to prevent distortion as pipe is coupled. Diagrams show how gasket works. Photographs show method of installation.

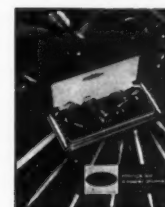
Hamilton Kent Manufacturing Co.



384—Vitrified Clay Pipe

Jointed vitrified clay pipe known as *Amvit*, with a built-in mechanical joint made from polyvinyl chloride, is described in four-page folder. Advantages such as infiltration prevention, quick installation, immediate backfilling, better flow, shock absorption, and quick testing in the field are pointed out.

American Vitrified Products Co.



385—Pipe Fittings

Catalog I presents the complete line of NIBCO wrought, cast solder, cast drainage, flanged, and flared tube fittings. It is a manual of technical information to help the consultant select fittings for copper tube installations. Included are rough-in measurements, advantages of using NIBCO fittings, engineering data.

NIBCO Inc.



386—Electric Wall Fountain

Bulletin T-474 describes new "Wall-Temp" Model WT-13, completely self-contained, refrigerated, electric wall fountain, which mounts flush to wall and off the floor at any desired height. Fully concealed plumbing. Complete engineer's specifications and capacity ratings. Capacity 13 gph.

Temprite Products Corp.



387—Entrainment Separators

Bulletin 810 contains information on low cost centrifugal "T" type entrainment separators. Explains the advantages of the new type separator. Included are selection and capacity charts for both air and steam, complete specifications for three types of separators, and charts of separator and trap recommendations.

Wright-Austin Co.



388—Wash Fountains

Catalog EW-8 describes in detail Haws' complete line of emergency eye-wash and drench showers. Photographs and drawings of eye-wash units, eye-face wash units, drench showers, multiple nozzle spray showers, dual combinations, portable units, freeze-proof assemblies. Full details on all industrial models.

Haws Drinking Faucet Co.



389—Steel Valves

Catalog 14 describes the complete Edward line of cast and forged steel valves for power, petroleum, chemical, marine, and industrial applications. Data includes ASA dimensions, ASA pressure-temperature ratings, and ASTM basic materials specifications.

Edward Valves, Inc., Subsidiary of Rockwell Manufacturing Co.



390—Cast Iron Pipe

Catalog of cast iron pipe, fittings, fire hydrants, water works gate valves. Specifications, dimensions, and weights of ball and spigot, mechanical joint, flanged pipe, and fittings covered. Mathews Modernized, Mathews Flanged Barrel, and R. D. Wood Swivel Joint fire hydrants described. Also Wood gate valves.

R. D. Wood Co.



391—Valve Comparison Chart

Bulletin 1012 is a OIC valve comparison chart, republished with up-to-date valve cross references. New features: breakdown on valve types by pressure class and design; federal specifications; valve trim cross reference chart; other valve manufacturers products cross referenced to OIC valves. Speeds up specifying.

Ohio Injector Co.



392—PVC Pipe and Fittings

Bulletin PF 1200, eight pages, presents a list of applications for PVC pipe and fittings where corrosion resistance, non-toxicity, and noncontamination are required. Mechanical, electrical, thermal, and miscellaneous properties of both normal impact and high impact PVC products are in table form.

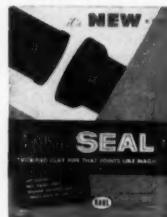
Luzerne Rubber Co.

PIPING, VALVES, and PLUMBING continued

**393—Iron Pipe, Tubing, Fittings**

Catalog L-127 describes the complete line of American ductile iron pipe, tubing, casings, fittings, and special castings. Includes valuable technical information; grades, specifications, dimensions, and weights. Typical applications include underground piping, industrial piping, well casing, and many others.

American Cast Iron Pipe Co.

**394—Clay Pipe**

Bulletin PS-101 describes Kaul Clay Company's Presto SEAL vitrified clay pipe. Socket and spigot ends are factory-molded polyester, with a rubber gasket permanently imbedded in the socket end. When socket and spigot ends of pipe are joined, a perfect, permanent, flexible seal is made in seconds.

Kaul Clay Co.

POWER EQUIPMENT and FUELS

**395—Firetube Boilers**

Bulletin BE-100 outlines the practical construction and operating features of 2-pass Continental automatic package fire-tube boilers in comparison to 3- and 4-pass designs. Two-color diagrams show flue gas flow in automatic boilers of several types. A technical discussion of heat transfer provides background.

Boiler Engineering & Supply Co., Inc.

**399—High Pressure Blowers**

Type HP Master Hi Pressure blowers for combustion air, jet pump operation, water blow-off, convection cooling, or any installation requiring steady air pressure or suction, are described in Bulletin 157. Blowers have shrouded impellers in sizes from 6 ounces to 2 pounds pressure. Fully illustrated.

Master Fan Corp.

**396—Gas and Gasoline Engines**

Bulletin SA-542-E describes the V-122 and the V-125 twelve-cylinder gas or gasoline engines manufactured by the Climax Division of Waukesha Motor Co. These engines develop a maximum of 520 and 610 horsepower respectively. Engines combine simple rugged construction with smooth running.

Climax Engine Manufacturing Co.

**400—Burners**

Twenty-page catalog describes Petro commercial-industrial oil, gas, and dual fuel burners used for heating, power, and process steam requirements. Includes section on "How to Select a Burner." Illustrates several typical installations and various burners, from 8 through 200 gal per hr oil capacity.

Petro.

**397—Underfeed Stokers**

Concise, illustrated instructions for operation of ram-type underfeed stokers with dump grates. Information covers starting fire, cleaning fire and restoring fuel bed, and common operating problems. It is printed on heavy paper in two colors and punched for easy hanging near firing unit.

Bituminous Coal Institute.

**401—Packaged Firetube Boilers**

Bulletin GB-1 gives testimonial proof of the value-packed Amesteam generator, packaged firetube boiler. Sizes available: 10 through 600 horsepower; 15 through 250 pounds design pressure. Lists well-known users with photographs of actual installations. Illustrated literature available upon request.

Ames Iron Works.

**398—Vibra-Grate Stokers**

A water cooled vibrating grate stoker (sizes from 25,000 to 150,000 pounds of steam per hour) that does not require a dust collector and assures freedom from smoke, even at low ratings. Burns low grade coals with top efficiency and is easily adapted for burning gas or oil in combination with coal, or singly.

American Engineering Co.

**402—Engine-Driven Generators**

Large engine-driven synchronous generators for all standard ratings and voltages, and speeds from 450 to 1800 rpm, are the subject of booklet 05B6139. Construction features and modifications are thoroughly discussed. Ratings are listed. Booklet also deals with belted and direct-connected exciters.

Allis-Chalmers.

POWER EQUIPMENT and FUELS continued



403—Atomizing Fuel Oil Burners

The Todd Vee-Cee type variable capacity mechanical atomizing fuel oil burner for installations with widely fluctuating loads is fully described in four-page bulletin TD56-16X. Bulletin shows special construction that gives uniform, easily oxidized spray, constant pressure and quick cold starting.

Todd Shipyards Corp., Products Div.



404—Spreader Stokers

New bulletin 860 illustrates and describes the Detroit RotoStoker, a spreader stoker with overthrow rotor feeders. For use with medium size boilers up to about 60,000 pounds of steam per hour capacity. Power dumping, hand dumping, or stationary grates. May be installed in almost any type boiler.

Detroit Stoker Co.



405—Jet Silencers

This 8-page bulletin describes Maxim jet silencers, portable, semi-portable, and stationary types for jet engine testing and run-up. It also describes Maxim sound barrier panels which have wide use in industry for sound-proof rooms, enclosures, and doors. Includes many illustrations and engineering drawings.

Enhart Mfg. Co., Maxim Division.



406—Spiral-Wound Gaskets

General catalog, 28 pages, tells about the development of the original spiral-wound gasket and its present applications in aviation, atomic research, process industries, power plants, and ships of the Navy and Merchant Marine. It also lists various metals and fillers used in the manufacture of these gaskets.

Flexitallic Gasket Co.



407—Tray Deaerators

Bulletin 4530-B2 describes and illustrates Worthington tray deaerators. Detailed cutaway illustrates many new features including spring loaded spray valves. Principle advantage is better inlet water atomization over the entire load range. Typical performance curve graph shown.

Worthington Corp.



408—Recirculation Generators

Basic advantages of the Type LFW forced recirculation generators for high temperature water are given in ten-page bulletin 700. Chart compares capital investment, operating costs, and maintenance and repairs for high temperature water and high pressure steam for district heating from central plant.

International Boiler Works Co.



409—Three-Pass Boilers

Webco-Ray automatic 3-pass packaged boilers for heating, power, and process steam are featured in the 1959 Webco catalog. Ratings, data, dimensions, installation details, and other specification data are given in this 8-page booklet. Capacities of these packaged units range from 30 to 600 boiler hp.

Western Boiler Co.



410—Oil and Gas-Oil Burners

A variety of oil and combination gas-oil burners are included in illustrated 24-page bulletin 5629. It describes rotary oil burners, firing units with integral air registers, complete package units with factory control panels. The oil volumeter that provides steady, uniform oil flow with any oil is shown.

Iron Fireman Manufacturing Co.



411—Induced Draft Fans

Bulletin L-3 covers the complete line of centrifugal induced draft fans. Included are rating tables shown at 600 F, dimension data, construction material specifications, recommended sizes of fans for oil, gas, or coal fired boilers. Typical installations are also shown.

Lehigh Fan & Blower Division,
Fuller Co.



412—Hydraulic Turbines

Consultants in hydraulic power will find 48-page brochure 02B7301 a valuable reference book. Turbines, reversible pump-turbines, and important accessories are discussed. Over 50 well-known public and private power and industrial installations are featured. Data on 97 installations is tabulated for quick reference.

Allis-Chalmers.



413—Packaged Boilers

Type C Superior Packaged Boilers for capacities from 20 to 350 bhp are described in this 3 color catalog. Unusually compact, providing economies of installation, the Type C has four-pass design, 5 sq ft of heating surface per bhp, and induced draft. Data and dimensions for units to burn oil, gas, or both.

Superior Combustion Industries, Inc.



414—Boiler Auxiliary Package Units

Bulletin 59-1 describes auxiliary package units available for boilers of 10,000 to 100,000 lbs steam per hour, steam pressure to 300 psig. Units have various combinations of deaerating feedwater heaters, boiler feed pumps, condensate surge tanks to reduce maintenance and to increase plant efficiency.

Wicks Boiler Co.

POWER EQUIPMENT and FUELS continued

**415—Wormfeed Stokers**

Bulletin 559 describes Canton's *Duraflex* wormfeed stokers for bituminous and anthracite coal. Included are specifications and ratings for bituminous coal, descriptive drawing showing assembly and method of feeding, components of the feeding assembly, model boiler room plan, and the many features of the stoker. *Canton Stoker Corp.*

**416—Engines**

Complete 80-page catalog includes power curves, sectional drawings, and subassembly photographs of six basic engines in 19 models, a power range of 100 to 2150 bhp. Diesel, gas, and dual fuel engines and generator sets are available as a custom installation.

*White Diesel Engine Division,
White Motor Co.*

**417—Boiler Feed Systems**

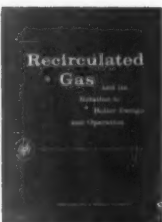
Catalog 55-C contains new specification and application data on standard and special design boiler feed systems from Schaub Engineering Company. Pumps furnished with Dura-Hard Electroplated impellers for "double" service life. High pressure boiler feed systems include rugged power plant pump line.

Fred H. Schaub Engineering Co.

**418—Viscous Fluid Heaters**

Bulletin 1.4K 1 describes heaters for viscous fluids. Type O is a standard straight tube preheater for fuel oils and similar fluids and Type TS is a standard tank suction heater for heavy fuel oils and other fluids of similar viscosity. Includes features, dimensions, diagrams, capacities, and fuel oil requirements.

American-Standard, Industrial Division.

**419—Recirculated Gas**

Bulletin G-96, "Recirculated Gas and its Relation to Boiler Design and Operation," is a booklet compiled by J. D. Andrew, Jr., A. M. Frendberg, and P. H. Koch. Contains definition of recirculated gas, its thermodynamic effect, mixing with combustion gas, and application to design and operation.

Babcock & Wilcox Co.

**420—Packaged Boilers**

Bulletin 178 describes Cleaver-Brooks line of packaged boilers built by the originator and largest producer of packaged boilers. Advantages of four pass, forced draft design, 5 square feet of heating surface per boiler horsepower for the CB models, 15-200 hp, oil, gas or combination fired are described.

Cleaver-Brooks Co.

**421—Preheaters**

The important points to consider in selecting a preheater for use with small boilers (25,000 to 250,000 lbs per hr) are discussed in four-page bulletin on the new package Ljungstrom air preheater. Explains how preheater saves fuel, increases boiler output and reliability, and permits use of lower grade fuels.

Air Preheater Corp.

**422—Burners**

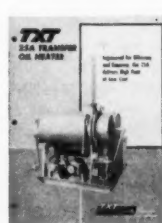
This new 16-page booklet illustrates and describes Ray Burner equipment for firing oil, gas, or combination oil or gas; manual, semiautomatic, and fully automatic models; rotary, pressure atomizing, inshot gas, packaged forced draft boiler-burner units. A burner for every domestic, commercial, or industrial need.

Ray Burner Co.

**423—Packaged Boilers**

Twelve-page catalog describes Type AS Superior packaged boilers for capacities from 4000 to 21,000 lbs steam per hr. Complete packages with rotary burners, integrated controls, soot blowers, refractory, and insulation, these units also have quiet rear mounted draft fan which provides air-cooling of furnace floor.

Superior Combustion Industries, Inc.

**424—Transfer Oil Heater**

Bulletin 25A-1 describes the 100% automatic, no freezing, no corrosion operation of the Texsteam 25A transfer oil heater which provides temperatures to 600°F with low pressure vessels and flow circuits. Unit is gas or oil fired. Bulletin includes specifications and curve for sizing to specific applications.

Texsteam Corp.

**425—Package Steam Generators**

New six-page bulletin entitled "More Performance From Less Investment" describes in detail Cyclotherm's line of 18 sizes of package steam generators 15 hp to 650 hp. Also specifications, on 10 sizes of new package hot water generators, 670 mbh to 6700 mbh.

*Cyclotherm Division
National-U.S. Radiator Corp.*

**426—Three-Pass Boilers**

Bulletin B-3240 describes the Titusville Titan 3-pass units for power and heat. They are precisely engineered to meet the most exacting mechanical and thermal specifications. Mechanical and thermal features are listed. Illustrations show the boiler with various types of burners available. Certified results in chart form.

Titusville Iron Works Co.

POWER EQUIPMENT and FUELS continued



427—Bent Tube Boilers

Bulletin VF VS-2 presents design and construction details and illustrates installations in a diversity of industries. Basic design of these two drum units provide maximum capacity where floor space and head room are limited. Furnaces handle fluids fired in suspension or with various types of stokers.

Henry Vogt Machine Co.



428—Shot Cleaning System

Bulletin 2145 covers the new Diamond shot cleaning system for the most efficient and economical cleaning of such external horizontal tube surfaces as superheaters, reheaters, economizers, and air heaters. Gives advantages, principles, construction, and operation. Chart shows draft loss from ineffective cleaning.

Diamond Power Specialty Corp.



429—Package Boilers

Catalog VP-3, 16 pages, describes the new Type VP package boiler. Following a section of background information is an outline of principal design features. These boilers are shop assembled and provide steam capacities from 4000 to 90,000 lb per hr. Space requirements and specifications are in table form.

Combustion Engineering, Inc.



430—Packaged Steam Generators

Bulletin PG-59-4 describes stoker-fired packaged steam generators manufactured by Foster Wheeler Corporation. Fully tested units available in standard sizes of 43,000, 50,000, and 63,000 lb steam per hour with pressures up to 250 psi. Photographs show installations and line drawings show construction.

Foster Wheeler Corp.



431—Refractory Fibre

Bulletin IN-245-A is a reprint of article about how Cerafelt, a high temperature refractory fiber originally developed for jet planes, is replacing old style fireboxes in oil burning furnaces. Cites economic advantages of material, installation procedures, properties, temperature ranges. Photographs show advantages.

Johns-Manville.



432—Packaged Scotch Boilers

Catalog 1016 describes the new line of Bonnie Scot packaged scotch type low pressure steam and hot water generators from National-U. S. Radiator. Offered in 5 models from 30 to 60 hp with net ratings from 499,000 to 1,498,000 Btu/hrs. Units are available for oil, gas, or combination firing.

National-U. S. Radiator Corp.



433—Gas Burners

Bulletin B-8 describes the Webster Kinetic gas burner with complete information on how to select burner size, the automatic operating controls, combustion safeguards, and control valve selection. Charts and diagrams illustrate information. Use of Kinetic for conversion of heating boilers is discussed.

Webster Engineering Co.

To order personal copies of these bulletins, please fill out the card between pages 2 and 3 or 54 and 55.



434—Fuel Engineering Data

BCI Fuel Engineering Section B-3 provides formulas, tables, and graphs enabling fuel consumers to make price, quantity conversions for coal, oil, and gas. Procedures cover comparison of efficiencies and costs on basis of local plant conditions. This 17-page booklet contains seven graphs and eight tables.

Bituminous Coal Institute.



435—Package Boiler

Bulletin MR-1A announces the new compact Model "R" Amesteam generator, a complete package boiler available in sizes ranging from 10 hp through 600 hp. Oil or gas fired. Each unit is completely equipped with all necessary boiler fittings, is guaranteed to operate at 80 percent thermal efficiency.

Ames Iron Works.



436—Automatic Coal Firing Units

A compact, automatic coal firing unit for installations of 175 hp to 350,000 pounds of steam per hour and upward. Engineered for top efficiency with both low and high ash coals. Exclusive conveyor feeder won't clog and provides even distribution throughout entire range, 50 to 7500 lbs coal per hr.

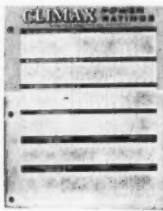
American Engineering Co.



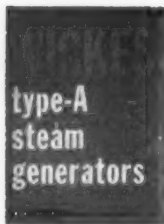
437—Pipe Flange Gaskets

Condensed general catalog describes and illustrates pipe flange gaskets, including compression-gage type, self-centering type, and gaskets for recessed fittings. Also shows gaskets for boiler manhole cover assemblies, and boiler handhole and tubecap cover assemblies. Illustrated with photographs.

Flexitallie Gasket Co.

POWER EQUIPMENT and FUELS *continued***438—Engines**

Bulletin SA-612-B, a complete listing of all Climax engines and complete power unit ratings showing maximum hp available for bare engines and recommended operating ratings for various applications of power units with accessories. Complete bulletins describing all models shown in the Power Chart are available. *Climax Engine Manufacturing Co.*

**439—Steam Generators**

Wickes type-A steam generators, compact, efficient, shop assembled water tube boilers, are illustrated and described in catalog 56-1. It gives typical superheater arrangements for the boilers with section, plan, and side views of drainable "S", pendant, and drainable superheaters. Specifications are given. *Wickes Boiler Co.*

**440—Burners**

Form 5808 describes light oil, gas, and dual-fuel oil-gas burner designed for operation against firebox pressure. Fires number 2 fuel oil and/or natural or LP gas. Special burner head produces high combustion efficiency and prevents flame pulsation. Models available for firing pressurized or natural draft boilers. *Iron Fireman Manufacturing Co.*

**441—Underfeed Stokers**

Catalog No. 401, fully illustrated, gives complete data on double retort underfeed stoker. This stoker is built for heavy duty service in the intermediate size range for boilers of about 20,000 pounds to 34,000 pounds of steam per hour capacity. Burns nut, pea and slack or crushed run of mine bituminous coals. *Detroit Stoker Co.*

**442—Packaged Boilers**

A completely new line of low and high pressure forced draft water tube packaged boilers is described in bulletin 1400. Known as the *Compak* series, these factory-tested units are offered in 22 sizes ranging in capacity from 12 through 750 horsepower. Engineering specifications with catalog literature. *International Boiler Works Co.*

**443—Firetube Boilers**

Bulletin E-35 and F-50 describe Continental automatic package firetube boilers for 15 to 250 psi operation in 20 to 600 hp sizes. Complete dimensions, specifications, and design data are included. Model F has 5 sq ft of heating surface (ASME) per bhp; Model E has slightly less. Efficiency exceeds 80% on gas or oil. *Boiler Engineering & Supply Co., Inc.*

**444—Rotary Burners**

Bulletin describes Johnson Model 53 fully automatic, metering pump rotary burners. This burner insures smooth automatic starts even after lengthy shut downs. Will fire on oil only, gas only or combination oil and gas. Available in 9 sizes from 28 hp to 560 hp. Detailed dimensions given. *S. T. Johnson Co.*

**444-A—Package Unit Burners**

Bulletin describes compact forced draft package unit burner. This single, coordinated, factory-tested assembly, ready for attachment to boiler, combines all necessary equipment for burning oil or gas fuels. Gives details of design and features. Diagrams are keyed to chart giving dimensions for all models. *S. T. Johnson Co.*

To order personal copies of these bulletins, please fill out the card between pages 2 and 3 or 54 and 55.

**445—Rotary Oil Burners**

The new Todd Series B rotary fuel oil burners are summarized in four-page bulletin TD56-82X. It includes a burner size selector chart and lists 11 advanced design features of seven basic sizes rated from 400,000 to 22,500,000 Btu per hr, with oil capacity from 3 gal per hr to 150 gal per hr. *Todd Shipyards Corp., Products Div.*

**446—"Maxim" Silencers**

"Guide to Maxim Silencers", a 4-page bulletin, is a handy guide to the complete line of Maxim Silencers. To help you select the right silencer for your purpose, it gives a capsule description of each type, lists model numbers and size ranges, and refers to available bulletins that give complete descriptions. *Emhart Mfg. Co., Maxim Division.*

**447—Burners**

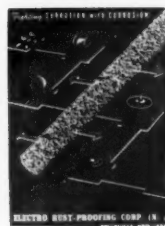
Factory engineered and built integral air register for control of combustion air is feature of Petro WR burner. Register controls entire air supply for maximum combustion efficiency. Models available for firing all fuel oils, including number 6, and for dual fuel oil-gas firing. For Scotch or firebox boilers. *Petro.*

PROCESS EQUIPMENT



448—Infra-Red Industrial Heaters

Bulletin PC 158 30-3 describes Panel-bloc, the infra-red radiant industrial heater. Brochure explains the many advantages of infra-red heating over conventional type heating. Typical industrial and commercial applications are pictured. Includes data on construction and operation as well as specifications. *Bettcher Manufacturing Corp.*



449—Rust-Proofing

"Fighting Corrosion with Corrosion" booklet TP-103-E-1, describes nature and causes of corrosion, and its control and prevention with cathodic protection. The booklet explains the function and applications of this electro-chemical system, and sets forth the various services offered by the manufacturer in the field. *Electro Rust-Proofing Corp.*



450—Custom Built Equipment

Bulletin E-1 illustrates a wide range of custom built equipment. Includes steam generators, stills and towers, heat exchangers, reactors, oil chillers, crystallizers, and ice making and refrigeration equipment, which serve numerous applications in power plants, refineries, chemical plants, and related industries. *Henry Vogt Machine Co.*



451—"Platecoil"

This bulletin, 59-PI, describes and illustrates the new Platecoil configuration. It contains pertinent information on construction, application, and advantages in heat transfer. Specifications, size, weight, and surface area of standard units are listed. Varied applications are pictured and discussed. *Tranter Manufacturing Inc.*



452—Materials Handling, Processing

Fully illustrated brochure 182, 36 pages, presents a report of R&S diversified services for coal and iron ore mining, steel mills, and railroads. It features materials handling and processing facilities; also ore beneficiation plants other than specialized coal preparation plants and fabrication in well equipped shops. *Roberts & Schaefer Co.*



453—Tubeaxial Fans

Bulletin 620 illustrates and describes Type BT and BTV belt driven tubeaxial fans for handling corrosive fumes, high temperatures, explosive fumes, abrasive dusts, dirt laden air, and high humidity. Drawings are shown for totally enclosed, corrosion resistant, and ventilated assemblies. Ratings and sizes chart. *Robbins & Myers, Inc., Propellair Div.*



454—Air Preheaters

Brochure entitled "The Ljungstrom Air Pre-Heater for Process Equipment" describes the fuel economy possible with this regenerator. Table of comparative fuel and power costs and graph clearly show these economies. Explains how added furnace capacity gives increased production and higher quality. *Air Preheater Corp.*



455—Products and Production

Catalog "This is RECO" describes RECO products, production, and design service in detail. Photographs, listing of practical dimensions, materials, special linings, specifications are shown for pressure vessels, storage tanks, process heat exchangers, pipe, duct, towers, columns, and autoclaves. *Richmond Engineering Co., Inc.*



456—Aftercoolers

How aftercoolers remove moisture from compressed air and gas is explained in bulletin 130. Schematic flow diagrams show how aftercoolers can cool and dry compressed air systems in any plant. This eight-page, three-color bulletin is profusely illustrated. Full line of air engineering equipment shown on last page. *Niagara Blower Co.*



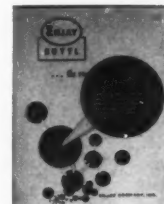
457—Autogenous Grinding

Bulletin AH-482 is a reprint of a recent article by Harlowe Hardinge on autogenous grinding, a subject which has aroused considerable interest in mining circles. This deals with a tumbling type of mill in which the grinding media for the material being ground is the material itself. Installation photographs. *Hardinge Co., Inc.*



458—Pressure Controllers

Bulletin D-4150A describes Fisher Wizard II pressure controllers, designed particularly for the process industries. It presents comprehensive information on construction features, operation, calibrated set point adjustment, reversed action, performance, and conversion to other modes of control. *Fisher Governor Co.*



459—Butyl Rubber

Twelve-page, two-color bulletin describes in detail Butyl rubber. Many applications of this rubber that stays "alive" are pictured. Many comparison graphs show effect of heat aging, electrical stability, shock absorption, sound damping, tear resistance, abrasion loss, gas permeability, and low temperature flexibility. *Enjay Co., Inc.*

PROCESS EQUIPMENT *continued***460—Corrosion-Proof Plastic**

Maintenance-free *Duracor* resists practically any acid, fume, or gas. Strong, lightweight units requiring minimum support also offer integral resistance to heat or flame. Hoods, ducts, elbows, and other parts can be either supplied from stock or fabricated to individual customer specifications.

Ceilcote Co., Inc.

**461—Dielectric Heaters**

Booklet 15B6431 describes the operating advantages of dielectric heaters for a variety of functions such as drying, baking, heating, and curing of non-conducting materials. Various sizes and styles are described. A listing of all units gives electrical requirements, Btu output, and physical sizes and weights.

Allis-Chalmers.

**462—Panelbloc**

Bulletin PH 959-41 is a case history of actual Panelbloc installation in a frozen food processing plant. Other case histories available cover diversified industries with discussion of the heating problems that were solved by using Panelbloc's radiant heat. Other subjects are turkey farms, fair grounds, industry.

Bettcher Manufacturing Corp.

**463—Multi-Zone "Platecoil"**

Bulletin 159, 48 pages, completely describes new Multi-Zone Platecoil, covering styles, dimensions, specifications, and operational data. Methods of calculating heat transfer equipment requirements are outlined. Typical installations are pictured and described. Available on request.

Tranter Manufacturing Inc.

**464—Process Equipment**

An integrated line of equipment for the process industries is described in 28-page catalog 25C6177. Equipment includes compressors, pumps, crushers, mills, screens, kilns, washers, material handling equipment, motors, control, heaters, metal detectors, turbine generators, condensers, and water conditioners.

Allis-Chalmers.

**465—Dry Grinding**

Bulletin 52 describes the Hardinge disc roll mill which is applied to dry grinding of materials such as talc, limestone, coal, phosphate rock, bauxite, and many others. Pneumatic roll loading. Pressure on rolls can be released or increased at will allowing complete flexibility. Illustrated with photographs and diagrams.

Hardinge Co., Inc.

PUMPS and COMPRESSORS

**466—Metering Pumps**

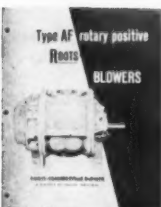
Catalog 900 describes the new line of *Masterline* metering and proportioning pumps. Available in four models with capacities to 1030 gph. New crank design features improved accuracy, parts interchangeability, operational efficiency, and ease of maintenance. Also featured is the new streamlined safety shield.

Hills-McCana Co.

**468—High Pressure Pumps**

Bulletin 295 on *Triplex* high pressure plunger describes American-Marsh models capable of pressures to 5,000 psi. Used for pressure testing and backwashing valves, pipes, vessels, and hydraulic equipment. Capacities 1.1 to 35 gpm. Bulletin shows drawings of cross-sections of construction.

American-Marsh Pumps, Inc.

**467—Positive Displacement Blowers**

Covering 18 standard sizes of positive displacement blowers, for air pressures to 10 psig and vacuum service to 12" hg, new Bulletin AF-258 provides selection and dimension information and typical installation views. Units have gear diameters of 7" or smaller, and capacity from 6 to 920 cfm on pressure service.

Roots-Connersville Blower Div.

**469—Aftercoolers**

Bulletin 712 is a 10-page technical book on aftercoolers particularly for the consultant. Cutaway drawings in three colors help show the operation. Benefits to be obtained from dry compressed air are given along with chart showing moisture left in given volume of air at pressure. Selection charts and installations.

R. P. Adams Co., Inc.

PUMPS and COMPRESSORS continued



470—Abrasive Liquid Pumps

Folder SP-507 describes the complete new line of Viking abrasive liquid pumps. New ceramic bearings and mechanical seals incorporated in this equipment has doubled and tripled the pump life when handling paints and inks, as well as other abrasive materials. Folder includes specifications, and dimensions. *Viking Pump Co.*



471—Rotary Positive Blowers

Series 400 and 600 rotary positive blowers, gas pumps, and vacuum pumps are described in bulletin S65C, including dimension drawings and cutaways. Volumes up to 20,000 cfm single stage with pressures to 10 psi or vacuums to 20 in. Hg. Features anti-friction bearings and wide-face herringbone timing gears. *Sutorbilt Corp.*



472—"CCVS" Pumps

Bulletin 21-C describes the new, improved Skidmore "CCVS" pumps. These pumps offer a capacity range from 500 to 10,000 sq ft EDR and discharge pressures from 20 to 40 lbs. The new single units are built in three sizes having 5, 10, and 20 gallon receivers. Includes features, construction, engineering data. *Skidmore Corp.*



473—Vertical Industrial Pumps

Bulletin B-505 describes complete range of vertical industrial service pumps. Capacities up to 40,000 gpm. Alternate types of drives available. Recommended for cooling towers, tank, line pumping, process and chemical pumping, also for drainage, dewatering, and recirculation. *Peerless Pump Division Food Machinery & Chemical Corp.*



474—Centrifugal Pump Drives

Right-angle solid shaft gear drives, for centrifugal pumps and industrial use — cooling tower installations, barge service, sewage disposal, fire and flood control — manufactured in a wide range of models to meet specific requirements, are described and illustrated with engineering details in eight-page catalog 29. *Johnson Gear & Manufacturing Co., Ltd.*



475—Centrifugal Pumps

Bulletin 715.1 furnishes user with complete selection data on a group of support head type centrifugal pumps comprising 24 sizes from 1" to 8" with capacity range to 3800 gpm. Heads to 300'. Pumps can be either oil or grease lubricated to suit users preference. Specifications and performance charts. *Goulds Pumps, Inc.*



476—Centrifugal Pumps

Bulletin 1004 describes the De Laval single stage, double suction, Type L, M, and P centrifugal pumps with capacities from 1000 to 20,000 gpm. Chart lists product features with construction data and advantages. Cutaway photograph with captioned arrows shows construction and operation. Specifications. *De Laval Steam Turbine Co.*



477—Chemical Solution Pumps

Bulletin 2-340 describes Bruner's chemical solution pump. Model 17 complete package includes power drive, electric cord, plastic tubing, foot valve, automatic injection nozzle control, and instruction manual. Diagrams show operation for different uses. Features of pump are listed with various accessories. *Bruner Corp.*



478—Suction Split Case Pumps

Bulletin 1200 describes Weinman double suction split case pumps for heavy duty pumping. Three types, L-1, L-2, L-3 for low, medium or high head service. Bulletin gives complete information including dimensions for 15 models available, lists features, and shows photographs of typical installations. *Weinman Pump Manufacturing Co.*



479—Submersible Water Pumps

Bulletin B1300 describes Sumo's industrial size submersible water pumps from 3 through 125 hp at 3550 and 1750 rpm. Heavy duty pumps used for municipal water supply and booster systems, industrial and commercial buildings, institutions, and irrigation. Features are pointed out in cutaway photograph. *Sumo Pumps, Inc.*



480—Gear Pumps

An economical gear pump, the Hydrex, for heavy-duty use on a wide range of pumping jobs, is described in eight-page bulletin H-2. It shows the simplified design, advantages, uses, sizes, and capacity of units with discharge to 350 gpm, for pressures to 500 psi, and fluid viscosities from 32 SSU to 250,000 SSU. *Sier-Bath Gear & Pump Co., Inc.*



481—Manual of Pumping Problems

"How to Solve Pumping Problems," 36-page instruction manual, covers important fundamentals of estimating requirements of the average pumping job. It contains sample problems on hydraulic systems, general transfer, and pressure transfer, plus tables, charts, and other pertinent engineering data. *Roper Hydraulics, Inc.*

PUMPS and COMPRESSORS continued

**482—Boiler Feed Pumps**

Bulletin 65 describes new heavy duty turbine-type boiler feed pumps (to 150 gpm), which give longer life with less maintenance. Pumps have specially hardened impellers; oversize, heavy duty bearings, shafting; and leak-proof, wet-or-dry shaft seals. Specifications and details are given in handy bulletin.

Fred H. Schaub Engineering Co.

**483—Centrifugal Pumps**

Catalog 4-PP-11 Rev. describes the features of Gorman-Rupp petroleum pumps. Straight-in-suction, no check valve, and an enclosed impeller featured in the "O" Series design. Temperature, altitude, viscosity, performance, and specification tables are available with the complete engineering data in bulletin.

Gorman-Rupp Co.

**484—Grout Pumps**

Bulletin WS-150 contains data and specifications on grout pumps, the only Simplex type for grout, slush, mud, and other heavy viscosity liquids. Pumps feature simplified heavy-duty design and can use air, steam, gasoline, diesel, electric motor or turbine drives.

Wagener Pump Div.,
Canton Stoker Corp.

**485—Turbine Power Plant Pumps**

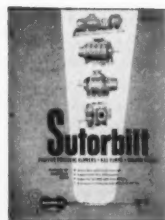
Easy-to-use Engineer's Guide gives condensed description, specifications, selection, and dimensional data on Roth turbine power plant pumps and packaged boiler feed and condensate return units. Full information on Roth certified hot water performance and 10 year shaft guarantee. Cover is pictorial index.

Roy E. Roth Co.

**486—Heavy Duty Pumps**

Catalog pages 27 and 28 features the new line of heavy-duty pumps for handling both thin and thick liquids with capacities of 17 to 164 gpm. Specifications and dimensions on the four size pumps and five reductions units. Pressures up to 200 PSI on lubricating liquids, 100 PSI on non-lubricating liquids.

Viking Pump Co.

**487—Pumps and Blowers**

California series rotary positive blowers, gas pumps, and vacuum pumps are described in bulletin S-59G with dimension drawings and capacity tables. For volumes up to 2480 cfm single stage with pressures to 10 psi or vacuums to 20 in. Hg. Features anti-friction bearings, wide-face timing gears, oil-free.

Sutorbilt Corp.

**488—Condensation Pumps**

Bulletin 14-B describes the "HS" condensation pump by Skidmore Corp. which is designed to give greater efficiency at a lower operating cost. Pump is connected to motor through a heavy type flexible coupling. Float switch can be removed from receiver as complete unit, easily adjusted to water levels.

Skidmore Corp.

**489—Turbine Pump Drives**

Right angle turbine pump drives, in standard and combination drive installations and available in a wide range of models to meet specific requirements of high or slow speed prime movers and pumps, are described and illustrated in nine-page catalog 30. Tables show power ratings and average efficiencies.

Johnson Gear & Manufacturing Co., Ltd.

**490—Centrifugal Pumps**

Bulletin 722.6 gives full details on wide line of 2-stage centrifugal pumps, sizes 1½ to 4", capacities to 1200 gpm. Heads to 1000'. Pumps can be furnished for either grease or oil lubricated bearings to suit users preference. Includes complete performance data and specifications for easy selection.

Goulds Pumps, Inc.

**491—Suction Centrifugal Pumps**

Bulletin 1002 describes single stage, single and double suction centrifugal pumps. Cutaway photographs show types G and I single suction pumps with capacity range from 50 gpm to 600 gpm and types G, I, and K double suction pumps with capacity range from 175 gpm to 600 gpm. Capacities and dimensions.

De Laval Steam Turbine Co.

**492—Air Compressors**

Catalog 36A provides technical data for the new and expanded Brunner air compressors, ¼ thru 20 hp. For the first time this informative brochure contains a "bound-in" specification and certification form 773. Typical industrial installations, product data, accessories, and air compressor selection charts.

Brunner Division, Dunham-Bush, Inc.

To order personal copies of these bulletins, please fill out the card between pages 2 and 3 or 54 and 55.

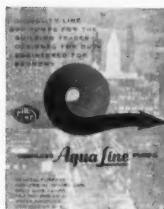
PUMPS AND COMPRESSORS *continued*



493—Displacement Type Pumps

Bulletin XA-458, 6 pages of condensed but complete data, describes positive displacement type pumps for handling all common gases at volumes from 3 to 880 cfm and pressures to 6 psig. Tables of performance and dimension data assist in selection from among 18 standard units with gear diameters of 7" or smaller.

Roots-Connersville Blower Div.



494—Centrifugal Pumps

Bulletin B-2100 illustrates and describes the Peerless AquaLine horizontal centrifugal pump line. Immediately available, these compact, easily installed pumps are applicable to many jobs calling for hot and cold water handling, circulation, and boosting.

Peerless Pump Division

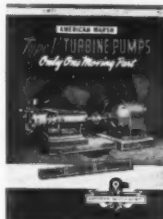
Food Machinery & Chemical Corp.



495—Centrifugal Pumps

Bulletin 1100 describes Weinman Types LB and LLB single stage, double suction, split case centrifugal pumps for circulating and booster service. Pumps have 140 to 340 gpm ratings, at 20 to 150 ft heads. Bulletin gives sectional view with keyed parts list, specifications, and performance curves.

Weinman Pump Manufacturing Co.



496—Turbine Pumps

In bulletin 450, Edition No. 3, data and specifications are given for 17 sizes of American-Marsh turbine pumps. Tables show choice of construction materials to suit various applications. Both disassembled and sectional views illustrate simplicity of design and construction. General dimensions and specifications.

American-Marsh Pumps, Inc.

REFRIGERATION and LIQUID CHILLERS



497—Liquid Chillers

Catalog AC-225 describes complete line of factory packaged liquid chiller units with open type compressors from 10 to 125 hp. Gives engineering details on unit components as well as complete capacity data in tabular form on each unit. Cutaway photographs show construction and operation. Required specifications.

Chrysler Corp., Airtemp Division.



500—Refrigerant Evaporators

Selection data is provided for a line of refrigerant evaporators designed for cooling liquids. These evaporators are constructed with many new features including a new inner-fin tube which triples the heat transfer surface. Bulletin EV-159 includes dimensions for all models, selection procedure, and other data.

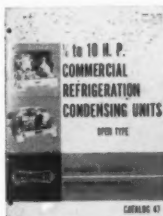
Bell & Gossett Co.



498—Liquid Chillers

Catalog AC-233 describes complete line of factory packaged liquid chiller units with hermetic type compressors from 3 through 30 hp. Gives engineering details as well as complete capacity data in tabular form on each unit. Cutaway photographs show construction and operation. Schematic wiring diagrams.

Chrysler Corp., Airtemp Division.



501—Refrigeration Condensing Units

Catalog 47 describes Brunner open-type commercial refrigeration condensing units. Complete specifications on models from 1/4 to 10 hp units are included in the new brochure. The wide horsepower range meets every job requirement. Separate engineering data sections for use by installing engineer. Models illustrated.

Brunner Div., Dunham-Bush, Inc.



499—Defrost Ceiling Coils

Catalog 2C9a describes Recold's water defrost ceiling coils for low temperature applications. These coils are used in applications from small frozen food refrigerators to the world's largest cold storage warehouse. Contains dimensions, specifications, installation information, and outstanding features.

Recold Corp.



502—Cold Plates and Snow Pans

Bulletin 663 gives data and specifications on Dean cold plates and snow pans for food service display and preservation. Promotes food sales by keeping food absolutely sanitary at all times. No cracked ice. Easily cleaned. Shows how to do your own estimating. Beautifully printed in four colors.

Dean Products, Inc.

REFRIGERATION and LIQUID CHILLERS *continued***503—Vapomatic Coils**

Catalog 12C9a describes patented Vapomatic which uses heat of compression in a new way to accomplish fast, fool-proof defrosting for below freezing applications. Includes complete descriptive data installation instructions, wiring diagrams for defrost control, dimensions, and specifications.

Recold Corp.

**504—Packaged Liquid Chillers**

Bulletin R4C covers a new line of packaged liquid chillers with multiple cylinder hermetic compressors. Chillers are available in sizes 10 tons thru 100 tons. All units are shipped completely assembled and are factory engineered and tested before shipment to insure proper performance. Tables of capacities. *Curtis Manufacturing Co.*

SOUND, SIGNAL, and ALARM SYSTEMS**505—School Communication System**

Catalog 482C describes the operation of Executone's new school communication system providing dual channel sound facilities (plus intercom), time signals, alarms, emergency announcements, and many other features. Contains complete technical information on all components, system wiring diagrams, specifications.

Executone, Inc.

**509—School Sound Systems**

Four-page brochure 7316-E-58 illustrates and describes a new and complete line of school sound distribution systems. It covers equipment suitable for the smallest to the largest school units. Building block flexibility of console styles, panels, and functions explained. Specification sheets furnished on request.

DuKane Corp.

**506—Clock and Program Systems**

Bulletin CL-572 describes the centrally controlled clock and program systems for schools, institutions, public buildings, and industry. Included is description of various systems with illustrated wiring diagrams. Features and applications of various types of clocks and audible signals are discussed. Specifications given.

Edwards Co., Inc.

**510—Doctors' Register System**

Brochure 22 describes the new Dial-In Doctors' In-and-Out Register System for large hospitals. The system permits inexpensive placement of registers at all doctors' entrances, eliminates space and wiring problems, reduces installation expense, and facilitates future expansion. For existing hospitals or new.

Auth Electric Co., Inc.

**507—Telephone Equipment**

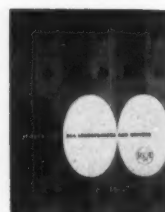
S. H. Couch Company's 12 page bulletin 128A includes wiring diagrams, specifications, and equipment data on U.S. approved mailboxes and apartment house telephone equipment. A variety of equipment is outlined to meet requirements of all types of apartment houses, both large and small.

S. H. Couch Co., Inc.

**511—Time Recording Systems**

"First Quality for Timing Accuracy" contains general description of electronic, synchronous wired, and Autotest impulse time and program systems with illustrations of the master time control, secondary clocks, and signals. Also illustrated and described briefly are attendance time recorders, job cost recorders.

Stromberg Time Corp.

**508—Loudspeaker Selector**

RCA loudspeaker and driver "Select-a-Guide" is an eight-page foldout brochure. Displayed at a glance are 24 different types of loudspeakers and drivers. This brochure greatly simplifies the selection of the correct unit for each application. Each unit is illustrated and complete specifications given. Form 3R3509.

Radio Corporation of America

**512—Communication Systems**

Catalog S-104R illustrates and describes 17 models, single channel to three channel communications systems. Both table top turrets and consoles with capacities from 22 to 180 rooms. Provisions included for telephone intercom, loudspeaker intercom, high fidelity FM-AM radio tuner, 3-speed transcription player.

Stromberg-Carlson, Special Products Div.

SOUND, SIGNAL and ALARM SYSTEMS continued



513—Multipair Telephone Wires

Bulletin T-10-59 describes Multipair Telephone Distribution Wires and Cables for rural, urban, and suburban distribution wires. Discussion of thermoplastic compounds is included as well as data on multipair drop cable and underground lead sheathed cable. Includes REA telephone construction manual.
General Cable Corp.



514—Clock Catalog

Covers clock and program systems — two types include synchronous motor-powered secondary clocks, the other combining secondary clocks, minute-impulse type. Both have simplified programming, automatic resetting of secondary clocks. Bell control boards, various type signals, and clocks included.
Standard Electric Time Co.



515—Signal and Alarm Systems

Bulletin 76-4999 describes three Honeywell signal systems for: 1) Programming over a master-time system (easiest to set); 2) fire protection (complete line, reliable source); and 3) critical-equipment surveillance from a central station (circuitry carries supervision plus communication over single pair of wires).
Minneapolis-Honeywell Regulator Co.



516—"Acoustic-Booths"

Bulletin describes Acoustic-Booths which make telephoning easy even in the noisiest places. Outlines principle, design, construction, and performance. Each model is illustrated and general specifications are given. Widely used in factories and other industrial locations.
*Burgess-Manning Co.
Industrial Silencer Div.*



517—Microphone Selector

RCA microphone "Select-a-Guide" is a fold-out brochure which displays at a glance fifteen different microphone types. Selection of the correct microphone for each application is greatly simplified. Photographs of microphones with range, impedance, and special features are included. Form 3R3287.
Radio Corporation of America.



518—Visual Nurse Call System

Catalog 387E describes the operation of Executone's Multi Audio Visual Nurse Call System for hospitals, which enables nurses to answer a patient's call from any nurse control station in the system. Contains complete technical information on all components, system wiring diagrams, sample specifications.
Executone, Inc.



519—Nurses' Call Systems

Vokacall brochure illustrates and describes complete audio-visual nurses' call system providing two-way communication between patient and nurse so sensitive that even a whisper is heard. The brochure outlines functioning of systems, with guide to specification writing and wiring diagrams.
Auth Electric Co., Inc.



520—Internal Telephone System

Catalog S-140 describes the benefits of a complete private internal telephone communications system. It points out profits, economy, and convenience offered by four Stromberg-Carlson switchboards with capacities from 10 to 74 lines. Four different type telephones either desk or wall are illustrated.
Stromberg-Carlson, Special Products Div.



521—Clocks and Signals

New engineers' and architects' catalog contains general descriptions, illustrations, specifications, and complete details on time and program systems (electronic, synchronous wired, *Autoset* impulse); clocks (secondary, synchronous, wall, double-faced, tower, special designs); signal equipment.
Stromberg Time Corp.



522—Signal Systems

A pocket size resume of all Edwards products for industrial and commercial applications. It fully describes the advantages and convenience of modern signaling, covering the full range from large control, communications and protection systems to single components. Various products pictured.
Edwards Co., Inc.



523—Communications Equipment

A new convenient wall chart of electronic and communications equipment symbols is offered consulting engineers. This time-saving guide is based on IRE, NEMA, and MIL standards and covers sound distribution, paging, private telephone, intercom, nurses' call, and MCS equipment symbols (17 x 22 in.).
DuKane Corp.



524—Hospital Signaling Equipment

Bulletin 137 includes wiring diagrams, specifications, and equipment data on visual paging, doctors register systems; and visual, psychopathic, manual and automatic audio-visual nurses call systems. The bulletin details one of the most complete lines of hospital signaling equipment.
S. H. Couch Co., Inc.

STRUCTURAL MATERIALS and EQUIPMENT



525—Metal Buildings

General catalog BD-958 describes the Parkersburg line of versatile metal buildings. Features include weather-tightness, rigidity, and flexibility. Designed with future expansion in mind. These features combine economy and quality. All types of buildings are shown from tool sheds to factories. Accessories, details.

Parkersburg Rig & Reel Co.



526—Sectional Concrete Buildings

Catalog describes the line of sectional concrete buildings made in 6, 8 and 12 ft. widths, and lengths in increments of 2 ft. Shipped knocked down with precast floors, roofs, hardware, and joint sealing materials for easy field assembly. Fire-proof storage, microwave, and mechanical equipment housing.

Permacrete Products Corp.



527—Concrete Tensioning Materials

Catalog PC-936 shows sizes, weights, strengths, and typical load-elongation curve of uncoated stress-relieved strand for pretensioned bonded prestressed concrete. Properties of galvanized strand and uncoated stress-relieved wire for post-tensioned design are listed. End fittings, bearing plates are illustrated.

John A. Roebling's Sons Corp.



528—Conditioning Concrete Surfaces

Brochure BP1071 contains application and test data on KURE-N-SEAL, a compound for curing, sealing, and dust-proofing newly placed concrete surfaces in one operation. Produces a transparent, hard film to protect the floor from traffic abrasion, water spillage, mild acids, and alkalis. Minimizes staining.

L. Sonneborn Sons, Inc.



529—Tubular Railings

A new bulletin on tubular railings has been prepared by Tubular Products, Inc. and is now ready for distribution. These are fitted and welded railings for industrial and commercial applications. They are ornamental and provide many safety features. Bulletin contains style drawings and photographs.

Tubular Products, Inc.



530—Waterstops

Four-page bulletin WS-59 covering complete line of rubber, vinyl, and neoprene waterstops with molded accessories such as unions, ells, tees, and crosses — both flat and vertical. Includes properties and characteristics, recommendations for use, methods of installing in formwork, and suggested specifications.

Williams Equipment & Supply Co.



531—Aluminum Windows

Catalog A-59 describes the complete line of Bayley aluminum windows, including original Bayley features. The booklet includes such items as projected windows, pivoted windows, class room windows, ribbon windows, and detention windows. Dimensions, construction, design, fasteners, materials, and finish.

William Bayley Co.



532—Horizontal Shoring

New 3-color bulletin shows Beatty-Pecco horizontal shoring used on variety of jobs. Shows cost saving advantages, sizes available, and gives permissible spans for slabs from 44 to 187 lbs/sq ft. Explains how simple wedge lock works and gives advantages over conventional falsework used in erection of structures.

Beatty Scaffold, Inc.



533—Service Fittings

Bulletin 493 illustrates design features, simplicity of assembly of new Spang service fittings, suitable for use with underfloor distribution systems of any manufacturer. Covers individual power and phone fittings and includes illustrations of linoleum pan, terrazzo holder, plus part numbers, and ordering information.

National Supply Co.



534—Masonry Wall Reinforcement

This four-page bulletin is printed in two colors and describes Dur-O-wall masonry wall reinforcement. Included are features, advantages, physical properties, and general specifications. Information on cavity wall construction, rod deformation, bonding, and report of tests are also contained in this bulletin.

Dur-O-wall.



535—Underfloor Electrification

Manual 3011-A outlines a new method of underfloor electrification using the top chord of a newly designed steel joist for electrical raceways. Gives details and outlines method of obtaining underfloor electrification economically. Pictures show step-by-step installation of accessories and use procedures.

Ceco Steel Products Corp.



536—Wire Reinforcement Study

New studies conducted by Armour Research Foundation agree with previous reports that the replacement of header courses by wire reinforcement *correctly designed* does not reduce the transverse strength of a wall. In fact there is an increase in strength of about 12 percent. Booklet contains illustrations of use.

AA Wire Products Co.

STRUCTURAL MATERIALS and EQUIPMENT continued



537—Electrified Floor System

Mahon electrified Cel-Beam floor systems designed to safeguard buildings against electrical obsolescence are detailed in this new 16-page bulletin M-58. Use with concrete topping and floor covering, fire resistance ratings, engineering data, dimensions, specifications, and load and property tables are given.

R. C. Mahon Co.



538—Steel and Aluminum Grating

This 16-page catalog shows the three basic types of grating construction; gives more than 30 dimensional drawings of subtypes; eight safe load tables covering steel and aluminum grating, roadway grating, and sidewalk slabs; tables on panel widths, tread widths, and floor armor. Planning layouts are given.

Borden Metal Products Co.



539—Steel Buildings

Stran-Steel catalog 56-1-109 gives complete information on the complete line of rigid frame buildings and Stran-Satin color. Color coating is a double protective layer of vinyl-aluminum that is available in blue, green, rose, bronze, gray and white. It is applied directly to the ribbed wall and roof panels.

Stran-Steel Corp.



540—Metal and Wood Doors

Bulletin DHSV-60 describes the D & H Decor-Dor line of flush-designed vinyl-on-steel, aluminum, and wood doors. Natural color illustrations show color and vinyl texture. Outstanding features of all three types, construction, sizes, and types of doors included. Wood doors have PyroDor structural mineral cores.

Dusing & Hunt, Inc.



541—Cable, Wiring, and Tubing

Two systems of support for all types of cable, wiring, and tubing are described in a 28-page illustrated catalog. Systems are engineered to be used interchangeably, depending on the weight of the load to be supported at any location. Globetray, the ladder-type tray, and cable-strut, the basket type, described.

Globe Co.



542—Clear Concrete Sealer

Bulletin 43 describes a clear sealer which cures, seals, hardens, and dustproofs concrete floors in one operation. Bulletin describes what this product is and the various advantages in its use. Information includes properties, surface preparation, method of application, coverage, drying time, and resistance factors.

A. C. Horn Companies.



543—Chord Steel Joists

New 52-page bulletin contains complete data on Laclede straight chord steel joists, "S" and "L" Series. The bulletin includes numerous photographs, drawings and charts, plus such detailed information as design and construction features, dimensions and specifications, load and spacing tables, installation data.

Laclede Steel Co.



544—Structural Bolts

Catalog describes Lamson high strength bolts for buildings, bridges, towers, and other applications, that give maximum holding power. Bolting principles, ordering data, prices are included. Bolt is distributed by 20 U. S. Steel Supply Division Steel Service Centers in key locations throughout the country.

Lamson & Sessions Co.



545—Rolling Counter Shutters

Bulletin 103 describes the Kinnear rolling counter shutters with midjet slats. These metal shutters afford protection against weather, pilfering, or illegal entry. End photographs show construction of slats. Diagrams show dimensions for both crank and push-up operation. Includes specifications and special features.

Kinnear Manufacturing Co.



546—Non-Shrink Mortar

Bulletin EPMM-4 describes Embeco premix mortar. This non-shrink mortar is especially formulated for making repairs to cracks, holes, ruts, and worn areas in all types of concrete surfaces. The seven step procedure for repairing damaged areas is covered with complete explanations. Photographs of each step.

Master Builders Co.



547—Perforated Metals, Screens

Hendrick general catalog, 135 pages, cross indexed, provides detailed descriptions of perforated metals, screens, and fabricated metals. Completely illustrated. Contains lists of sizes and styles, engineering data and useful tables of gauges, decimal thickness and weights. Ordering information and specifications.

Hendrick Manufacturing Co.



548—Aluminum Roof Curb

Bulletin SCE-89 describes self-flashing extruded aluminum Sonotrol roof curb. Easily installed, it provides a structurally stable support for the roof exhaustor or motor or gravity operated dampers. This device helps to reduce sound build-up developed by roof fans. Installation instructions, drawings, specifications.

Penn Ventilator Co. Inc.

STRUCTURAL MATERIALS and EQUIPMENT continued

**549—Roof Deck**

Catalog BT-593, January 1959, describes a new concept in roof construction. *Tufcor* roof deck with insulating concrete plus built-up roof forms lightweight slab for strong, fire-resistant roof construction. Booklet illustrates completed projects using *Tufcor*, construction details, and other design data.

Granco Steel Products Co.

**550—Steel Buildings**

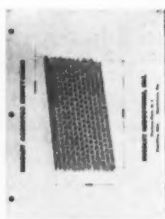
Catalog 530 describes a complete line of steel buildings for commerce and industry. Twenty pages of full color show buildings available with clear span up to 120 feet. Illustrations show how steel panels combine with other exterior materials to give pleasing appearance. Construction details. Accessories listed.

Inland Steel Products Co.

**551—Insulating Concrete**

New bulletin C11-1959 describes *Permalite* insulating concrete for roof decks and floor fills. Specifications for mixing and application are given. General characteristics of *Permalite* concrete are also discussed. Engineering data, which includes safe uniform loads and physical properties, on roof deck systems.

Great Lakes Carbon Corp.

**552—Asbestos Honeycomb Partitioning**

Catalog sheets containing information on Nicolet's asbestos honeycomb partitioning are available. Results of tests made in accordance with accepted procedures give weight, compressive strength, water absorption, moisture absorption, and heat loss. Two types available, Type I for interior and Type X for exterior.

Nicolet Industries, Inc.

**553—Geodesic Dome**

The latest issue of Graver's employee magazine summarizes this fabricator's services. Feature story describes the geodesic dome built as a repair shop by Union Tank Car Co. at Baton Rouge. Other stories cover refining vessels, alloy process equipment, sprinkler tank installation, oilfield equipment.

Graver Tank & Mfg. Co.

**554—Fluted Steel Foundation Piles**

Catalog No. 91, 24 pages, contains information on physical properties and design features, standard weights and volumes of Monotube fluted, steel foundation piles. Included are photos of typical installations, test driving data, and other technical data of particular interest to consulting engineers.

Union Metal Manufacturing Co.

**555—Wire Rope Catalog**

A complete basic catalog for selecting wire rope for any use. Cross sections of different types of rope show construction. Rope diameters, breaking strength, and weight are given for all classifications. Well illustrated showing different uses. Wire rope fittings are illustrated.

American Steel & Wire Division,
U. S. Steel Corp.

**556—Welded Steel Grating**

New eight-page illustrated bulletin describes Gary welded steel grating and treads. Has easy-to-use table of safe loads, weights and symbols, and panel widths. Included is data on fastening devices illustrated by drawings. Information on specifying grating and treads.

Rockwell-Standard Corp.,
Grating Division.

**557—Access Locks**

Bulletin 451 describes standard size low pressure and high pressure nuclear containment shell access locks, both automatic and manual. Operating and safety features are listed and described and specifications given. Offers not only personnel locks but equipment locks, escape lock, and special locks.

Henry Pratt Co.

**558—Marzaic and Broomed Panels**

This new 8-page full color catalog showing samples of Marietta Marzaic and broomed finish surfaces is now available. The catalog includes photographs, construction details, specifications on Marzaic and broomed panels, and other facts on many company services.

Marietta Concrete Division
American-Marietta Co.

**559—Steel Stair Treads**

Tread-Grip steel stair treads combine strength of construction with safe, non-slip footing, according to four-page bulletin HTP2130. This brochure describes such features as A. W. *Algrip* nosing, electroforged and welded construction, and twisted cross bars. Included are detail drawings and dimensions.

Horace T. Potts Co.

**560—Industrial Doors**

Sixteen-page catalog describes the types of doors manufactured and installed for industrial building and aircraft hangar installations. Included are canopy type, motorized slide, turn-over, and vertical lift doors. Doors such as for crane entrances and the *Byrna-perture* for hangars are also described and illustrated.

Byrne Doors, Inc.

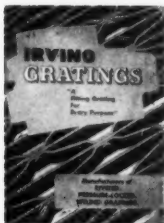
STRUCTURAL MATERIALS and EQUIPMENT *continued*



561—Metal Buildings

All-new general line Catalog 1671 for Butler buildings includes complete information on both all-metal and system buildings for commercial, industrial, and community use. Illustrates and describes rigid frame construction for both standard and low-pitch roofs, describes cover panels and construction features.

Butler Manufacturing Co.



562—Flooring, Grating and Treads

General grating catalog F-400 contains illustrations, descriptions, and complete engineering data on grating flooring, treads, and floor armoring (riveted, press-locked, and welded types). Irving grating is safe, durable, fireproof, ventilating, clean, and economical for industrial and power plant flooring and stairways.

Irving Subway Grating Co., Inc.



563—Foundation Pipe

Catalog FP-13558 describes three basic types of foundation pipe, pipe piles, caissons, and Hel-Cor pile shells for use under bridges, buildings, and other structures. Typical installations, dimensions, properties, and specifications are given. Data on pile driving hammers and pile bearing capacity.

Armco Drainage & Metal Products, Inc.



564—Roof Deck Assembly

Tectum box section roof deck assembly combines light weight, galvanized box section sub-purlins and Tectum roof deck planks. High speed clips speed erection; savings are evident in labor, materials, purlin spacing and time. Catalog contains complete loading and rating tables, erection procedures.

Tectum Corp.



565—Silicone Based Paint

Bulletin 7-904 shows how structures and equipment can be protected by silicone-based paints up to 100% longer before refinishing is necessary. Case histories demonstrate resistance to weathering, corrosion, and increased heat stability. List of silicone-based paint producers is included.

Dow Corning Corp.



566—Duct Systems

Bulletin 491 contains drawings, part numbers, and photographs of the three Spang duct systems for power, phone, and intercom. Underfloor duct (for regular slab construction), headerduct (for cellular floors), and industrial duct (large capacity for heavy requirements in phone and intercom systems).

National Supply Co.



567—Colored Aluminum Panels

A new color booklet introducing Alcoa's Alumalure colors, eleven special baked enamel finishes on all sheet products. Swatches of actual enamel shown. Five of the colors contain aluminum pigment, for a rich metallic effect. Also included are application suggestions and descriptive materials.

Aluminum Company of America.



568—Machinery Grout

New machinery grout five times stronger than concrete offers unique combination of oil and chemical resistance, excellent bond to metal, high compressive and tensile strength. It is fast-hardening and nonsetting. No. 648 Grout is especially recommended for permanently seating machinery subjected to severe conditions.

Ceilcote Co., Inc.



569—Rope and Chain Fittings

Catalog No. 950-2 describes and illustrates the complete line of Crosby-Laughlin drop forged fittings for wire rope and chain. The catalog information is of time saving value to consulting engineers in that complete dimensional information is given as well as safe working loads. Indexed.

Crosby-Laughlin Division.



570—Steel Deck

Catalog D-60 covering four steel deck sections, produced in a 24 in. and 12 in. module. Includes description, section property tables and load tables in bending and deflection, specifications, construction details, and other information on steel deck used as curtain walls, partitions, and permanent floor forms.

R. C. Mahon Co.



571—Dome Slab Construction

Manual 4007 gives sizes, erection procedures, typical arrangements, design data, and typical installations for this new method of forming "waffle type" two-way dome slab construction with one-piece forms especially designed for exposed ceiling construction. Gives features, removal procedures, and outlines services.

Ceco Steel Products Corp.



572—Scaffold Shoring

Bulletin BP-10 describing Beatty scaffold shoring is composed of 6 pages and printed in 2 colors. Contains diagrams, shoring data tables, and description of frames. Wing-nuts and studs are replaced with labor-saving patented snaplocks. Various applications are pictured. Also described is Pecco shoring.

Beatty Scaffold, Inc.

STRUCTURAL MATERIALS and EQUIPMENT *continued***573—Metal Gratings and Treads**

Bulletin 1110 was designed to help the engineer when specifying grating and treads. Welded grating available in steel and steel alloys and pressure-locked grating can be had in aluminum, brass, bronze, and stainless steel. Photographs and drawings show details of construction. Complete specifications included.

Dravo Corp.

**579—Precast Concrete Crossing Slabs**

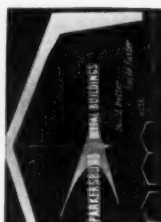
Bulletin X-541 gives complete information on Permacrete precast concrete crossing slabs. These edge-armored slabs provide smooth riding surfaces with greater safety and eliminate constant maintenance of railroad grade crossings. Widely used on crossings throughout industrial plant properties.

Permacrete Products Co.

**574—Seals and Gaskets**

Four-page bulletin SG-659 covering complete line of *Weatherite* seals for various types of control joints in block constructed walls. It also covers masonry gaskets of nonabsorbent elastomer for use between sill and coping stones, brick or stone wall panels, and masonry and structural steel members.

Williams Equipment & Supply Co.

**580—Metal Buildings**

Catalog BD-659, contains pictures, details, and story of the newest addition to the famous Parkersburg quality line of metal buildings. *Clear-Span* from 40' to 120'. Any length. The company looking for real economy and plus quality in one building, should investigate. You build better and faster with SF Series.

Parkersburg Rig & Reel Co.

**575—Concrete-Filled Columns**

Concrete-Filled Columns: complete illustrated literature on pipe columns, square and rectangular tube columns, including safe loads, physical properties, and sample computations. Most fire-resistant, nonfire-proof column made, your key to better, safer construction. Types of columns and connections shown.

Tubular Products, Inc.

**581—Bearing Bolts**

Engineering, ordering data on new Lamson high strength bearing bolts for buildings, bridges, towers, and other applications. Bolt has highest shear strength, greatest resistance to slip of all structural bolts. Distributed by 20 U.S. Steel Supply Division Steel Service Centers throughout the country.

Lamson & Sessions Co.

**576—Floor Treatment Products**

Brochure BP 6030, contains thumbnail descriptions of 21 products designed for floor treatment, water proofing and dampproofing, roof coatings, and protective coatings. The bulletin makes it possible to quickly select the specific product to meet the most frequent maintenance or construction problem.

L. Sonneborn Sons, Inc.

**582—Rolling Doors**

Bulletin 101, 36 pages, is a complete catalog of the many types of doors made by Kinnear. It gives information on the types of operations, both manual and electrical; elevation drawings; mounting methods for various applications and locations; specifications; and explains special construction features of these doors.

Kinnear Manufacturing Co.

**577—Steel Joists and Studs**

Stran-Steel catalog gives complete information, properties, and dimensions for lightweight nailable steel joist and studs, punched channel studs, channels, columns, beams, zee sections, wide flange beams, roof deck, rubbered decking, and metal curtain wall panels. Fully illustrated with photographs and drawings.

Stran-Steel Corp.

**583—Flooring Panels**

Catalog 270 describes Cellufloor, the new panel which serves as both structural sub-floor and cellular raceway for in-floor electrification, communication, or heating systems. Includes load tables, section properties, construction and installation details, and specifications. Typical applications pictured.

Inland Steel Products Co.

**578—Steel Rope**

This publication contains information required for selection and preparation of specifications for wire, strand, and rope used on guyed structures and suspended systems of all kinds, except major suspension bridges. Both standard and special fittings for use with bridge strand and bridge rope are illustrated.

John A. Roebling's Sons Corp.

**584—Roof Coatings**

Bulletin describes Dry-N-Tite liquid, plastic, aluminum, and primer roof coatings for patching, resurfacing, and coating build-up composition on corrugated or sheet metal, slag, gravel, concrete, and felt roofs. Roofs can be patched when damp or wet.

*A. C. Horn Companies,
Division of Sun Chemical Corp.*

STRUCTURAL MATERIALS and EQUIPMENT continued



585—Prestressed Concrete

New 12-page bulletin describes the productions, application, and characteristics of Laclede 7-wire strand prestressed concrete. Numerous photographs and text illustrate the entire manufacturing operation. Bulletin also includes typical load elongation curves on $\frac{3}{8}$ " and $\frac{7}{16}$ " diameter strand, A.S.T.M. specifications. Laclede Steel Co.



586—Grilles

A 132 page handbook indexed for quick reference for the consulting engineer. Over 100 grille and register designs are shown in scale drawings, with photographs of grille sections in actual size. Complete details of dimensions and perforations. Contains both standard and exclusive Hendrick patterns.

Hendrick Manufacturing Co.



587—"Pozzolith" Concrete

Bulletin P-36B discusses Pozzolith, the admixture for concrete. Points out how the use of this ingredient increases strength, bond strength, workability, durability; reduces shrinkage, permeability. It is recognized as an air-entraining agent, makes concrete resistant to scaling, and provides retarding action.

Master Builders Co.



588—Concrete Slab Reinforcement

Catalog BC-592, January 1959, furnishes complete information on Cofar, a combined form and reinforcement for concrete slabs. Product advantages, illustrations of completed projects using Cofar systems, construction details, fire ratings, data on E/R Cofar (for electrical and communication flexibility in floor).

Granco Steel Products Co.



589—Expanded Metal Partitioning

New catalog describes Globe Safe-Gard expanded metal partitioning with exclusive Quick-Erect patented fittings for easy method of guarding conveyors and machines and for all in-plant partitions. Catalog shows method of erection of prefabricated panels, full range of sizes available, and complete engineering data.

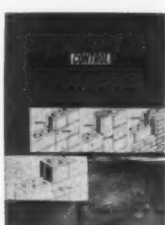
Globe Co.



590—Sliding Fire Doors

Bulletin DHS-60 describes Dusing & Hunt's new flush design Sliding Pyro-Dar. This fire door has UL Class "A" 3 hr fire test rating plus lowest heat transmission rating. Built in sectional interlocking panels, these doors have solid mineral core construction. New PyroMatic door release.

Dusing & Hunt, Inc.



591—Rubber Control Joints

Four-page bulletin describes Rapid wide flange and Rapid regular rubber control joints for use in masonry walls. Included are features, advantages, physical properties, general specifications. Line drawings show both types with dimensions, also method of application are included in this bulletin.

Dur-O-wal



592—Curtain Wall Panels

Bulletin 1727 announces and describes a new insulated curtain wall panel for industrial and commercial buildings. Butler Monopanel is the first factory-insulated panel that is factory cut to fit a pre-engineered structural system. Exclusive double tongue-and-groove design makes it automatically self sealing.

Butler Manufacturing Co.



593—Floor Gratings

Bulletin covers an improved conception for the installation of floor gratings, using the single-span divider-bar, combined with Borden's Type K reversible grating. Simplifies maintenance as well as installation. Bulletin pictures and describes installation at the new Public Service Generating Station, Linden, N. J.

Borden Metal Products Co.



594—Curtain Wall Systems

Catalog C-58 outlines Bayley aluminum or steel curtain wall systems and insulated panels with Bayley aluminum projected windows. Advantages of Bayley curtain walls include choice of distinctive wall treatment without cost of special design, a wall engineered to accommodate a building's movement.

William Bayley Co.



595—Masonry Reinforcement

All new 1959 Sweet's brochure now available. AA Wire Products Company, manufacturers of masonry reinforcement and masonry ties, announce that the all new 1959 Sweet's brochure is now available. The new brochure features design drawings, photographs of installations, and suggested guide specifications.

AA Wire Products Co.



596—Grating and Stair Treads

This 16-page, 2-color bulletin is a picture story of Kerrigan Iron Works. Shows how grating is fabricated into various forms and cutouts. Bulletin contains standard table of safe loads, engineering data, data on various types of anti-skid stair treads, and testing methods. Pictures grating types and stair treads.

Kerrigan Iron Works, Inc.

WATER TREATMENT and WASTE DISPOSAL



597—Ion Exchange Units

Sixty-page manual Z-5 explains ion exchange water conditioning processes, the resins and equipment used, quality of water produced, and typical costs involved. Designed as a practical handbook to aid engineers in proper selection and operation of ion exchange units in water conditioning applications. *Nalco Chemical Co.*



598—Sewage Pumping Station

New full color bulletin 601-A on factory-built sewage pumping stations describes operation, advantages, features of design including Smith & Loveless "Non-Clog" sewage pump. Center spread contains full color cutaway showing operation. Complete engineering data manual on lift stations available. *Smith & Loveless, Inc.*



599—Supplying Water

Twenty-four page booklet entitled "Supplying Water" describes the unique Ranney methods of supplying more clear water to industry and municipalities. Valuable information is included on horizontal collectors, infiltration galleries, Vertube wells, Ranney intakes, and new dewatering process. *Ranney Method Water Supplies, Inc.*



600—Automatic Water Softeners

Bulletin 615, a 24-page guide to water treating, describes manual and automatic zeolite water softeners, mixed-bed and multi-column deionizers, dealkalizers, ion exchangers, filters, purifiers, aerators, and degasitors. Also covers spray and tray type deaerating heaters and water treating chemicals for every need. *Elgin Softener Corp.*



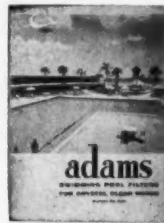
601—Filter Plants

Filter plants for the removal of iron, manganese, taste, odor, and gas are described in a new General Filter bulletin. Various problems are listed and answers given. Four basic treatment methods are described and graphically shown in drawings. Actual installations in all parts of the country are shown. *General Filter Co.*



602—Centrifugal Pumps

Bulletin 2127-B1 covers centrifugal pumps for sewage disposal, irrigation, drainage, and general low-head water supply. Sectional drawings and dimension tables give information on five horizontal models and sixteen vertical models. Nozzle positions, for the twenty-one models are diagrammed. *Worthington Corp.*



603—Swimming Pool Filters

New 24-page technical bulletin for consulting engineers on swimming pool filters for municipal, public, and institutional pools. Contains typical installations, cross-section and operational drawings, charts, and factual comparison. This manufacturer does not offer a filter for backyard type pools. *R. P. Adams Co., Inc.*



604—Gravity Separators

Bulletin WC-123 describes the uses and design features of the Graver Rotarake^(R) clarifier, a gravity separator and thickener. Features are described and illustrated and the operation of the unit is discussed. The four unit types available are illustrated with engineering drawings. Actual installations pictured. *Graver Water Conditioning Co.*



605—Trash-Sewage Pumps

Bulletin on nonclogging, high and dry, open impeller, trash-sewage pumps. These self-priming centrifugals are available in 2, 3, 4, and 6 in. sizes. Feature the ability to handle solids up to 1 1/2, 1 1/2, 2, and 2 1/2 inches in diameter. These pumps are useful in dewatering, sewage, and industrial sump applications. *Gorman-Rupp Co.*



606—Diatomite Pressure Filters

Bulletin 2-323 covers the line of Bruner diatomite pressure filters for swimming pools. Standard filters are available in sizes from 12 to 672 sq ft. Features include a septum with interlocking plastic disc core and plastic cloth sleeve. Schematic diagrams and comparison charts for diatomite and sand filters. *Bruner Corp.*



607—High-Flow-Rate Clarifier

Bulletin CL-158 describes the Illco-Way continuous high-flow-rate clarifier, an up-flow coagulator design that is adaptable to a wide variety of water and waste treatment applications, including lime-soda dealkalization, removal of iron, color, turbidity, organics, silica, and chemical waste treatment. *Illinois Water Treatment Co.*



608—Water Stills

Catalog "H" describes Barnstead's complete line of water stills specially designed for hospital use. In capacities of from 1/2 gallon to 1000 gallons per hour and operated by steam, electricity, gas, and kerosene. Other models for double and triple distillation are also described in this useful catalog. *Barnstead Still & Sterilizer Co.*

WATER TREATMENT and WASTE DISPOSAL continued



609—Gate Hoists

Catalog GH-353 describes gate hoists specifically designed to control water levels on hydro-electric power plant installations. Illustrates some typical hoists. Lists types of stationary and traveling gate hoists and the types of power dam gates for which they are applicable. Capacities from 1 to 100 tons.

D. J. Murray Manufacturing Co.



615—Underdrain for Sand Filters

Bulletin M-100 describes a patented underdrain for rapid sand filters which is constructed of asbestos-cement. Complete corrosion resistance, simple installation, and structural strength are a few of its advantages. Details of construction with photographs, specifications, and pressure loss curve included.

Graver Water Conditioning Co.



610—Water Control Gates

Catalog G-3258 gives complete information on a wide variety of models and sizes of gates for sewage plants, water works, and flood control-slide gates, flap gates, roller and radial. Data on lifts, hoists, accessories, and specifications included. Completely illustrated with diagrams and photographs.

Armco Drainage & Metal Products, Inc.



616—Mixed-Bed De-Ionizers

Bulletin 512 describes single-column mixed-bed de-ionizers that deliver high quality water, free from all ionizable impurities including CO₂ and silica, at much less than distillation or evaporation cost. "Double-Check" design gives added capacity and prevents loss of ion exchange material.

Elgin Softener Corp.



611—Treatment Tanks

Bulletin AET-59 contains full-color illustrations of water and effluent treatment tanks. They are steel-reinforced concrete structures faced on both sides with vitrified tile laid with corrosion-resistant mortar. Tanks are exceptionally attractive in appearance. Included are drawings showing wall construction.

Stebbins Engineering & Mfg. Co.



617—Water Treatment Equipment

Bulletin E describes the automation of ion-exchange and water treatment equipment. A suggested specification is included, together with typical illustrations and descriptions of important design features. Automatic control systems described are adaptable to any automatic valve sequencing operation.

Illinois Water Treatment Co.



612—Dicalite Diatomite Filters

Bulletin BW-13 covers the use of dicalite diatomite filter aids in municipal water supply and swimming pool filtration. The 16-page booklet includes diagrams which show the basic characteristics of diatomite filtration systems and discusses both cost and operating factors in some typical applications.

Great Lakes Carbon Corp.



618—Sewage Pumping Stations

New bulletin 615-B describes the factory-built "Mon-O-Ject" pneumatic ejector sewage lift stations. Contains features of design, operational characteristics, and advantages of this low-cost ejector station. Cutaway photograph in full color shows operation. Engineering data manual on lift stations available.

Smith & Loveless, Inc.



613—Lime Slaking

"Recent Developments in Lime Slaking", bulletin RA-2187-C, quotes performance figures and explains difference between slurry and paste lime slaking techniques. Describes how new lime paste slaker speeds up process, reduces installation size and gives higher quality results. Operational diagram and photographs.

Wallace & Tiernan Inc.



619—Supplying Water

Ranney's revised 24-page booklet entitled "Supplying Water" describes the unique Ranney methods of supplying more clear water to industry and municipalities. Valuable information is included on horizontal collectors, Vertube wells, Ranney intakes, and Ranney's new dewatering process.

Ranney Method Water Supplies, Inc.



614—Upflow Clarifiers

In bulletin 5811 models C, CP, CPS, P and CF of General Filter Company's upflow clarifiers are described and illustrated. Flow charts and important features, essential to economical and efficient operation, are included. Typical contraflo industrial, utility, and municipal installations are shown and described.

General Filter Co.



620—Cation Exchanger

Bulletin Z-12 presents complete technical information on Nalcite HCR-W, new stress free cation exchanger. Explains hydrogen cycle and sodium cycle operations and discusses use of HCR-W in industrial and municipal applications. This product is manufactured by the Dow Chemical Co. for Nalco.

Nalco Chemical Co.

Index of Advertisers' Literature

Manufacturer	Item No.	Manufacturer	Item No.	Manufacturer	Item No.
AA Wire Products Co.	536, 595	Elgin Softener Corp.	600, 616	Parkersburg Rig & Reel Co.	525, 583
ACF Industries, Inc., W-K-M Div.	351, 369	Emhart Mfg. Co., Maxim Div.	405, 446	Pass & Seymour, Inc.	124, 174
Acme Industries, Inc.	38, 193	Enjay Co., Inc.	459	Peerless Electric Co.	66, 79
Adams Co. Inc., R. P.	469, 603	Everlasting Valve Co.	341, 382	Peerless Pump Division	473, 494
Advance Transformer Co.	254	Executone Inc.	505, 518	Food Machinery & Chemical Corp.	458
Aerofin Corp.	54, 197	Exairbanks Co.	340, 375	Food Ventilator Co.	526, 579
Aerovox Fan Co., Inc.	31, 44	Federal Pacific Electric Co.	87, 96, 105, 125, 134, 148, 158, 170	Formacrete Products Corp.	400, 447
Agel Manufacturing Co.	15, 18	Feedrail Corp.	281, 298	Petro	217, 237
Air Preheater Corp.	421, 454	Fisher Governor Co.	354, 458	Petrometer Corp.	199, 210
Allen-Bradley Co.	226, 238	Fitzgibbons Boiler Co., Inc.	42, 190	Pfaff & Kendall	308
Allen Manufacturing Co., W. D.	183, 184	Flexitall Gasket Co.	406, 437	Philadelphia Gear Corp.	243, 247
Allis-Chalmers	112, 182, 303, 402, 412, 461, 464	Fly Ash Arrestor Corp.	3, 26	Pittsburgh Corning Corp.	207, 283
Aluminum Company of America	567	Flynn Mfg. Co., Michael	30, 203	Planet Corp.	315, 318
American Air Filter Co., Inc.	15, 39	Foster Wheeler Corp.	300, 411	Porta-Trac, Inc.	311, 319
American Cast Iron Pipe Co.	370, 393	Fyr-Fyter Co.	181	Potts Co., Horace T.	559
American Engineering Co.	398, 436	General Cable Corp.	127, 513	Powell Co., Wm.	340, 374
American Gas Association	63, 76	General Electric Co.	98, 106, 117, 132, 144, 156, 159, 167, 179	Powers Regulator Co.	223, 236
American Gilsonite Co.	241, 248	General Filter Co.	401, 614	Pratt Co., Henry	557
American Hoist & Derrick Co.	278	Globe Co.	541, 589	Pyle-National Co.	58
American Marsh Pumps, Inc.	468, 496	Golden-Anderson Valve Specialty Co.	338, 376	Radio Corporation of America	558, 517
American Standard Industrial Div.	61, 418	Gorman-Rupp Co.	483, 605	Ranney Method Water Supplies, Inc.	599, 619
American Vitified Products Co.	345, 384	Goulds Pumps, Inc.	475, 490	Rayburn Co.	422
Ames Iron Works, Inc.	401, 435	Granco Steel Products Co.	549, 558	Recold Corp.	499, 503
AMP Inc.	133	Graver Tank & Mfg. Co., Inc.	289, 553	Reliance Gauge Column Co.	233, 240
Anacanda Wire & Cable Co.	100, 146	Graver Water Conditioning Co.	604, 615	Republic Steel Corp.	116, 191
Anemostat Corporation of America	62, 78	Great Lakes Carbon Corp.	551, 612	Richmond Engineering Co., Inc.	196, 455
Appleton Electric Co.	123, 257	Guth Co., Edwin F.	258, 270	Ric-wil, Inc.	356
Armco Drainage & Metal Products, Inc.	563, 610	Hamilton Kent Mfg. Co.	339, 383	RLM Standards Institute, Inc.	249, 256
Armstrong Machine Works	33, 350	Haughton Elevator Co.	457, 465	Robbins & Myers, Inc., Propeller Div.	57, 453
Arrow-Hart & Hegeman Electric Co.	109, 151	Haws Drinking Faucet Co.	322, 388	Roberts & Schaefer Co.	292, 452
Art Metal Construction Co.	312	Heinemann Electric Co.	138, 172	Rockwell Co., W. S.	324, 367
Asphalt Institute	200, 205	Hendrick Manufacturing Co.	547, 586	Rockwell-Standard Corp., Grating Div.	556
Auth Electric Co.	510, 519	Hetherington & Barner, Inc.	221, 264	Roebbling's Sons Corp., John A.	113, 203, 527, 578
Automatic Switch Co.	219, 223	Hevi-Duty Electric Co.	118, 139	Rome Cable Corp.	107, 173
Babcock & Wilcox Co.	352, 419	Hewitt-Robins, Inc.	306, 307	Roots-Connersville Blower Div.	467, 493
Barber-Colman Co.	26, 60, 74, 211	Hills-McCanna Co.	333, 464	Roper Corp., George D.	481
Barco Manufacturing Co.	337, 371	Horn Companies, A.C.	542, 586	Roth Co., Roy E.	485
Barnebey-Cheney Co.	4, 13	Ideal Electric Co.	94, 142	Royal-McBee Corp.	310, 320
Barnstead Still & Sterilizer Co.	359, 408	Illinois Water Treatment Co.	607, 617	S & C Electric Co.	160
Bayley Co., Wm.	531, 594	Inland Steel Products Co., Inc.	550, 583	Schaub Engineering Co., Fred H.	417, 482
Beatty Scaffold, Inc.	532, 572	International Boiler Works Co.	408, 442	Schutte & Koerting Co.	321, 366
Bell & Gossett Co.	189, 500	Iron Fireman Manufacturing Co.	410, 440	Sier-Bath Gear & Pump Co., Inc.	309, 483
Benjamin Electric Mfg. Co.	262, 272	Irving Subway Grating Co., Inc.	202, 562	Simplex Wire & Cable Co.	154, 177
Bettcher Mfg. Corp.	449, 462	I-T-E Circuit Breaker Co.	89, 95, 122, 131, 141, 150, 161, 165, 178	Sims Co., Inc.	187, 198
B-I-F Industries, Inc.	225, 277	Jaffray Manufacturing Co.	275, 302	Skidmore Corp.	472, 483
Bituminous Coal Institute	397, 434	Jann-Air Products Co., Inc.	35, 80	Smith & Loveless, Inc.	598, 618
Blonder-Tongue Laboratories, Inc.	108	Jerguson Gage & Valve Co.	231, 355	Smoot-Holman Co.	253
Boiler Engineering & Supply Co.	395, 443	Johns-Manville Corp.	246, 431	Soiltest, Inc.	216, 235
Borden Metal Products Co.	529, 593	Johnson Gear & Manufacturing Co., Ltd.	474, 489	Sonneborn Sons, Inc., L.	528, 576
Bruner Corp.	477, 606	Johnson-March Corp.	2, 17	Sorgel Electric Co.	147, 175
Bruning Co. Inc., Charles	313, 316	Johnson Service Co.	222, 239	Southwestern Plastic Pipe Co.	130, 362
Buell Engineering Co., Inc.	11, 299	Johnson Co., S.T.	444, 444-A	Speedline Stainless Steel Fittings	365
Buensod-Stacey, Inc.	52, 85	Joy Manufacturing Co.	128	Spencer Turbine Inc.	7, 294
Buffalo Forge Co.	55, 75	Kaiser Aluminum & Chemical Corp.	121, 163	Square D Co.	104, 111, 115, 119, 147, 171
Burgess-Manning Co.	188, 516	Kalamazoo Tank & Silo Co.	285, 296	Standard Electric Time Co.	186, 514
Burnham Corp.	28, 56	Kaul Clay Co.	394	Stebbins Engineering & Mfg. Co.	290, 611
Burt Manufacturing Co.	49, 86	Keasbey & Mattison Co.	244, 358	Stran-Steel Corp.	539, 577
Bussman Mfg. Div., McGraw-Edison Co.	99, 129	Kerite Co.	137	Stromberg-Carlson	512, 520
Butler Manufacturing Co.	561, 592	Kerrigan Iron Works, Inc.	206, 596	Stromberg Time Corp.	511, 521
Byers Co., A.M.	342, 381	Kinnear Manufacturing Co.	545, 582	Strong, Carlisle & Hammond	323, 379
Byrne Doors, Inc.	560	Kiegl Bros.	251	Sumo Pumps, Inc.	479
Canton Stoker Corp.	415, 484	Kohler Co.	162	Superior Combustion Industries, Inc.	413, 423
Carrier Corp.	37, 73	Kraloy Plastic Pipe Co., Inc.	176, 332	Sutorbit Corp.	471, 487
Ceco Steel Products Corp.	535, 571	Laclede Steel Co.	543, 585	Swartwout Co.	47, 83
Celco Co., Inc.	460, 568	Lamson & Sessions Co.	544, 581	Sylvania Lighting Products, Inc.	263
Chrysler Corp., Airtemp Division	497, 498	Lennox Industries, Inc.	46, 71	Tapecoat Co.	329, 368
Clairage Fan Co.	36, 77	Lightolier, Inc.	252, 266	Tectum Corp.	564
Cleaver-Brooks Co.	194, 420	Limiter Corp.	361	Temprite Products Corp.	335, 386
Climax Engine Mfg. Co.	396, 438	Luzerne Rubber Co.	334, 392	Testmate Corp.	363, 424
Clyde Iron Works, Inc.	276, 279	McDonnell & Miller, Inc.	213, 234	Thermal Engineering Corp.	215, 232
COLT Ventilation of America, Inc.	44, 185	McPhibben Lighting Co.	259, 267	Tinker & Rator	215, 232
Combustion Engineering, Inc.	24, 429	Magnetrol, Inc.	214	Titusville Iron Works Co.	403, 445
Committee on Steel Pipe Research	59, 353	Mahon Co., R. C.	537, 570	Todd Shipyards Corp.	402, 445
Conco Engineering Works	274, 283	Marlo Coil Co.	50, 84	Torif Manufacturing Co.	6, 14
Condenser Service & Engineering Co., Inc.	192, 344	Marietta Concrete Corp.	286, 558	Tranter Manufacturing, Inc.	451, 463
Cyclotherm Division	70, 425	Master Builders Co.	546, 587	Tubular Products, Inc.	529, 575
Radiator Corp.	8, 67	Master Fan Corp.	51, 399	Union Metal Manufacturing Co.	204, 554
Connor Engineering Corp.	43	Miller Co.	240, 249	U.S. Electric Motors, Inc.	88, 155
Cook Co., Loren	507, 524	Minneapolis-Honeywell Regulator Co.	53, 515	U.S. Gauge, Div. American Machine & Metals, Inc.	220, 224
Crosby-Laughlin	569	Moloney Electric Co.	153, 166	U.S. Steel Corp., American Steel & Wire	208, 555
Crouse-Hinds Co.	97, 261	Mueller Co.	349, 377	Viking Pump Co.	470, 486
Curt's Manufacturing Co.	22, 504	Murray Manufacturing Co., D. J.	23, 609	Vogt Machine Co., Henry	427, 450
Cyclotherm Division	70, 425	Nalco Chemical Co.	597, 620	Wagner Electric Corp.	102, 304
National-U.S. Radiator Corp.	212	National Supply Co.	533, 565	Wallace & Tiernan, Inc.	613
Darling Valve & Mfg. Co.	357	National-U.S. Radiator Corp.	25, 432	Walbridge Engineering Corp.	218, 433
Davis Instruments Co.	265, 271	Naylor Pipe Co.	347, 373	Weighing & Control Components, Inc.	229, 280
Day-Brite Lighting, Inc.	195, 502	Neff & Fry Co.	287, 291	Wel-McLain Co.	19, 20
Dean Products, Inc.	41, 73	Nesbitt, Inc., John J.	27, 81	Weinman Pump Manufacturing Co.	478, 495
DeBothez Fans Div., American Machine & Metals Inc.	40, 72	New York Blower Co.	29, 82	Western Boiler Co.	409
DeLaval Steam Turbine Co.	476, 491	Niagara Blower Co.	65, 456	Westinghouse Electric Corp.	91, 93, 103, 114, 136, 163, 169, 180, 209, 220, 225, 264, 268, 305
Detroit Stoker Co.	404, 441	NIBCO, Inc.	336, 385	White Diesel Engine Div.	126, 416
DeZurik Corp.	360	Nicolet Industries, Inc.	552	White Motor Co.	282, 283, 295, 301
Diamond Power Specialty Corp.	230, 428	Northern Blower Co.	1, 12	Wicks Boiler Co.	414, 439
Dow Corning Corp.	145, 545	Nugent & Co., Inc., Wm. W.	330, 378	Williams Equipment & Supply Co.	530, 574
Dracoo Div. of Fuller Co.	9, 273	Ohio Injector Co.	331, 391	W-K-M Division of ACF Industries, Inc.	351, 369
Dravo Corp.	509, 521	Onan & Sons, Inc. D. W.	140, 157	Wood Co., R. D.	378, 390
DuKane Corp.	501, 492	OZALID, General Aniline & Film Corp.	314, 317	Worthington Corp.	407, 602
Dunham-Bush, Inc.	534, 591	O. Z. Electrical Manufacturing Co.	120, 143	Wright-Austin Co.	326, 387
Dur-O-Wal Products, Inc.	540, 590			Yarnall-Waring Co.	327, 380
Dusing & Hunt, Inc.	10, 325			York Corp., Sub. of Borg-Warner Corp.	32, 68
Dustex Corp.	346, 372			Young Radiator Co.	34, 69
Ebco Manufacturing Co.	506, 522				
Edwards Co., Inc.	343, 389				
Electric Machinery Mfg. Co.	92, 164				
Electric Products Co.	110, 152				
Electric Storage Battery Co.	90, 135				
Electro Rust-Proofing Corp.	449				